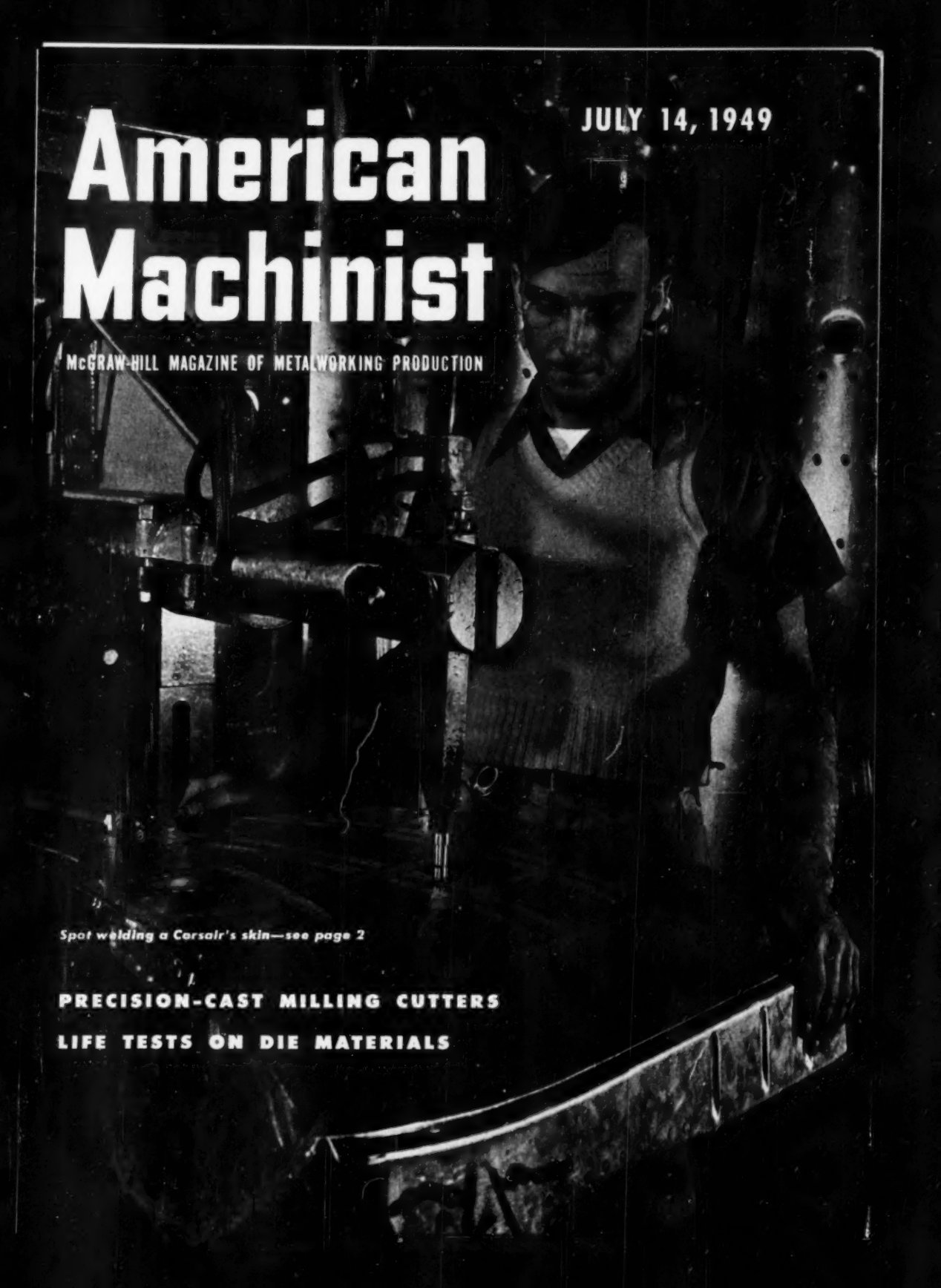
JULY 14, 1949

American Machinist

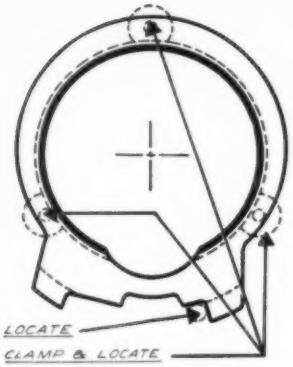
McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION



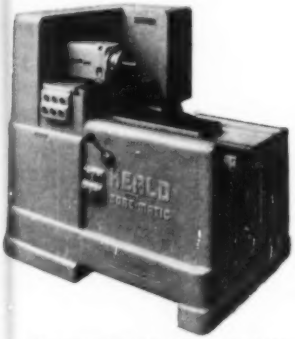
Spot welding a Corsair's skin—see page 2

PRECISION-CAST MILLING CUTTERS

LIFE TESTS ON DIE MATERIALS



Detail of overdrive balk ring, showing clamping and locating arrangement and surfaces bored and chamfered in a single high-speed automatic cycle.



For this operation, the Heald Model 221 Bore-Matic is equipped with a two-station hydraulic clamping fixture, dual boring-heads, and special feed-out quills, as shown below.

Production of Overdrive Balk Rings

INCREASED FROM 1200 TO 2000 PIECES PER SHIFT

...on a New Heald Model 221 Bore-Matic

When this new Heald machine took over the job of borizing overdrive balk rings, production went up almost 100 per cent. What's more, the customer reports that the operator and foreman are greatly pleased with the equipment—because it's easier to operate, easier to set tools, easier to load and unload. And they particularly like the efficient guarding that keeps the coolant from spattering up the machine and the operator.

This Model 221 Bore-Matic is arranged with a quick-acting hydraulic clamping fixture for boring and chamfering two parts simultaneously. An unusual feature of this machine is the unique feed-out quill arrangement. As the table travels to the left, the quills bore and plunge chamfer on the back side of the part. Then, when they have traveled beyond the bore, a stud in the fixture pushes them back and outward to chamfer the front side of the part. The table then reverses and the quills automatically retract, boring again on the return table stroke.

If you have a precision finishing problem, in either borizing or grinding, why not let Heald engineering and experience help you do the job faster, easier, and at lower cost. Your nearest Heald representative is at your service.

THE HEALD MACHINE COMPANY, Worcester 6, Mass.

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PRECISION INTERNAL AND SURFACE GRINDERS

PRECISION BORE-MATIC FINISHING MACHINES

American Machinist

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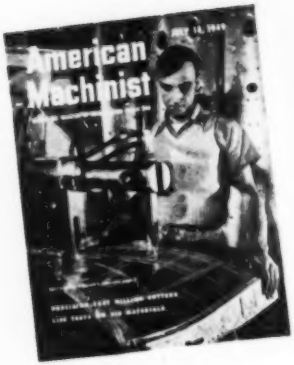


Chips and QUIPS

Our Cover . . . A worker at Chance Vought Aircraft spotwelds skin to the framework of a center-section air intake and oil cooler duct for an F4U-5 *Corsair*, currently a first-line Navy fighter-bomber. The machine is a Taylor-Winfield spotwelder.

Abrasives . . . E. L. Hemingway, formerly with Gisholt, has put down the gems of his knowledge of abrasives for superfinishing into a compact 4-page article which we bring you herewith. It's one you'll want to check back on time and time again.

And . . . Tony Zino has given us a series of tips on how to clean a hydraulic system. He gives procedures, and suggests which to pick to suit your conditions.

Analyzing Value . . . Some months ago, we found that General Electric was following a new and interesting technique for picking pennies off the cost of components. We give you in our current Special Report both the details of the technique and some typical examples of savings. The principles are applicable to any plant, large or small, and are worth your careful study for application in the cost-conscious days ahead.

Just In Case . . . Watervliet Arsenal had the same shortages everyone else did with small tools in World War II. A critical one was milling cutters. So Chief Metallurgist Penrose did some experimenting with precision casting broken bits into cutters. The picture-by-picture report in this issue will provide food for thought—and an idea, just in case.

Toolmen Note . . . In addition to the article on cast cutters, this issue includes details of machining heavy cylinder liners, by J. F. Stevenson, asst. works manager of Cooper-Bessemer, a description of an aluminum welding fixture that's easy to handle, results of life tests on die materials, and more on selection and application of portable tools.

Japanese-American . . . Now that the Japanese can write us again, we're being treated to those strange rearrangements of the English language. Our latest goes as follows: "Dear all the members of McGraw-Hill Co., we thank you very much for your kindness.

"We had accepted a few sample copys of magazines, these magazines maked us open eyes in astonishment at American superior technics and excellent staffs who edit them.

"It was our earnest desire to read the magazine American Machinist, but now we had it again after the long wartime as a leader in this way, and we don't know how to express our earnest thankfulness.

"We NTN Co., which is one of the most superior bearing maker at least in Japan, shall make effort to do much for the world technics, but in order to accomplish our desire, it is needless to say that you American leadership is need more than the former." The signer is E. Kayama, manager of the Mukogawa Plant, Toyo Bearing Mfg. Co.

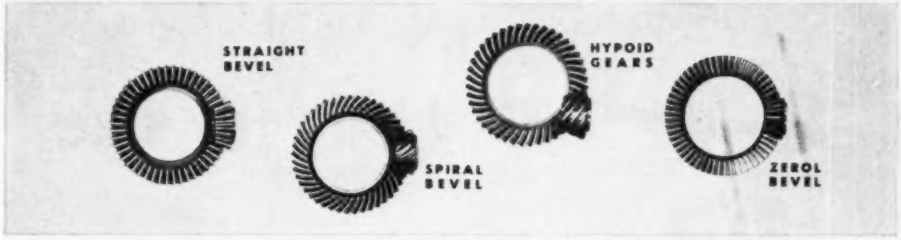
Coming . . . July 28 *A.M.* will include as the Special Report a detailed compendium of cost, metallurgical and production data on induction-hardening spur gears. There'll be articles on machinability, on metal spray, on drawing rectangular shapes, on jig milling, tools for the blind, and a system for controlling gage accuracy. This information is so hot it will make you forget the weather.

J. H. PENROSE
received his BSME from Notre Dame in 1939 and went immediately to Allegheny Ludlum Steel Corporation where he became assistant mill metallurgist two years later. He joined Watervliet Arsenal in 1943 as metallurgist, and in 1945 was appointed director of laboratories. In this issue he presents the story of precision-cast milling cutters, collaborating with . . .

CATHERINE T. AMOND,
metallurgist at Watervliet Arsenal since January, 1942. Miss Amond was graduated from Russell Sage College in 1940, with a B.A. in Chemistry. She also attended Siena College and Rensselaer Polytechnic Institute for courses in mathematics, physics and metallurgy.

COMPLETE ENGINEERING SERVICE

ON YOUR BEVEL GEAR PROBLEMS



As builders of bevel gear machinery for the manufacture of straight bevel, spiral bevel, Zerol bevel or hypoid gears, we offer our services to you . . . in designing . . . in estimating production time and costs . . . in recommending the best equipment most suited to your requirements.

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SOLUTIONS OF YOUR BEVEL GEAR DESIGN PROBLEMS,

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RECOMMENDATIONS ON THE RIGHT EQUIPMENT FOR YOUR NEEDS,

Production

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This data sheet is provided for your convenience. You are cordially invited to submit the details necessary for our engineers to cooperate in making their recommendations to meet your Bevel and Hypoid Gear needs.

BEVEL AND HYPOID GEAR DATA

1. Application .....
2. Gear ratio desired ..... Exact Approximate
3. Shaft angle .....
4. Shaft offset (hypoid) .....
5. Power to be transmitted and speeds
   (a) Normal hp ..... at ..... rpm of pinion
   (b) Maximum hp ..... at ..... rpm of pinion
6. Material specifications
   (a) Gear .....
   (b) Pinion .....
7. Send assembly blueprint or sketch showing:
   (a) Driving member and direction of rotation.
   (b) Means of absorbing axial thrust in both directions and for absorbing radial loads.
   (c) Provision for adjusting gears axially.
   (d) Mounting distance of each member.
   (e) Whether gear operates in vertical or horizontal plane.
   (f) Gear case limitations.
   (g) Method of connecting gear set to power source.
8. Service conditions
   (a) Type of load
   Continuous ..... Intermittent .....
   Shock ..... Reversing .....
   Give duration of loads wherever possible. If a reversing load, indicate duration of operation during major portion of time.
   (b) Method of lubrication
   Splash ..... Forced feed ..... Other means .....
9. State unusual conditions such as extreme temperatures, moisture, and abrasion .....

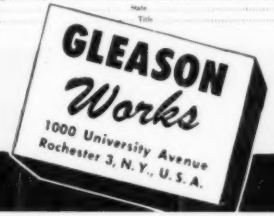
Date .....

Send Recommendations To:
Company .....
Street Address .....
City ..... State .....
Attention of ..... Title .....

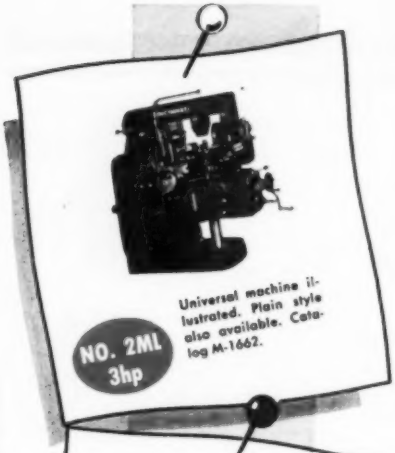
WHAT WE NEED to help you

For design engineering: (1) Preliminary layouts or prints of proposed bevel gear drive designs, (2) Type of drive, (3) Horsepower and speed required, (4) Type of loading (constant, intermittent or shock), and (5) Driving member and direction of rotation.

For production engineering: (1) Blueprints of your bevel gear designs, (2) Material specifications and manufacturing tolerances, (3) Quantity of gears to be produced per month, and (4) Number of working hours per month available for gear production.



Builders of Bevel Gear Machinery for Over Eighty Years



NO. 2ML 3hp

Universal machine illustrated. Plain style also available. Catalog M-1662.

NO. 2MI 5hp

Universal machine illustrated. Plain and vertical styles also available. Catalog M-1662.

NO. 2 DIAL TYPE 7½hp

Universal machine illustrated. Plain and vertical styles also available; all styles with Medium or High Speed Range. Catalog M-1623-1.

Try this for size

In milling machines, size and power go together like chest goes with waist measurements in suits. Take the popular No. 2 size millers, for example. CINCINNATI offers them in *three power ratings:*

No. 2ML—3 hp

No. 2MI—5 hp

No. 2 Dial Type—7½ hp

You can save operating expense by choosing the power rating that fits your kind of work. And to accommodate the most common type of milling operations in your shop, you have a choice of styles:

No. 2ML { Plain / Universal

No. 2MI { Plain / Universal / Vertical

No. 2 Dial Type { Plain / Universal / Vertical

In other ways, too, you save with CINCINNATI: automatic individual lubricating system for vertical screw . . . independent, directional control levers help the operator avoid mistakes . . . Dynapoise overarms increase cutability. Write for literature and get the complete story.

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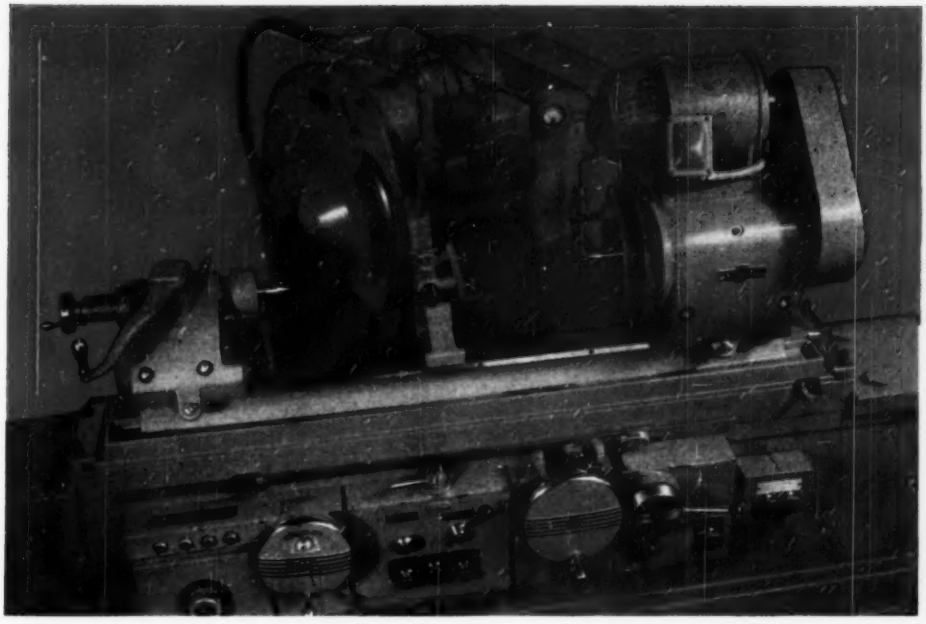
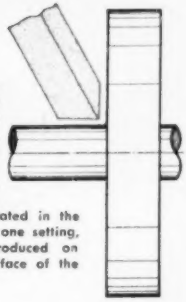


Left-Handed CINCINNATI FILMATIC GRINDER

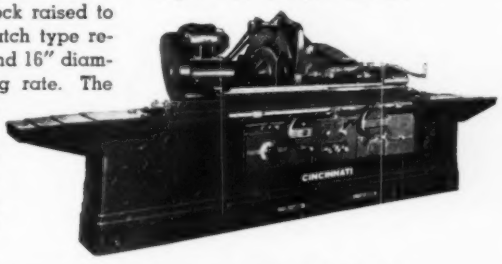
— brightens up a long face!

It's no trick to grind the diameter and the face of an adjoining flange when there's not much difference in size, but when the ratio increases to four or five, then additional problems must be overcome. The machine illustrated here—a semistandard CINCINNATI FILMATIC Angular Wheelhead Grinder—grinds the body diameter of the part, and at the same setting, the face of an adjoining flange up to 16" diameter. Starting with a stripped down CINCINNATI FILMATIC 10" Plain Hydraulic Grinder, Cincinnati Application Engineers added the following units: right-hand headstock raised to swing 16" diameter; left-hand raised footstock with latch type retraction of center; 30° angular wheelhead raised to grind 16" diameter work; 5" hydraulic cross traverse at a grinding rate. The machine handled the job perfectly, accurately sizing the stem diameter while producing a high-grade finish on the face of the flange at the same setting. ¶ Perhaps you could use this type of equipment to advantage for some of your cylindrical grinding operations. Why not talk it over with our Application Engineers?



Above: CINCINNATI FILMATIC 10" Plain Hydraulic Grinding Machine, with angular wheelhead, transposed headstock and footstock, and extended cross traverse, developed for grinding parts of the type illustrated in the drawing at the right. In one setting, high-grade finish is produced on both the stem and the face of the flange.

Below: CINCINNATI FILMATIC 10" Plain Hydraulic Grinding Machine. Also available in 14"-L size. Catalog G-572. Between-center lengths 18", 36", 48", 72" and 96".



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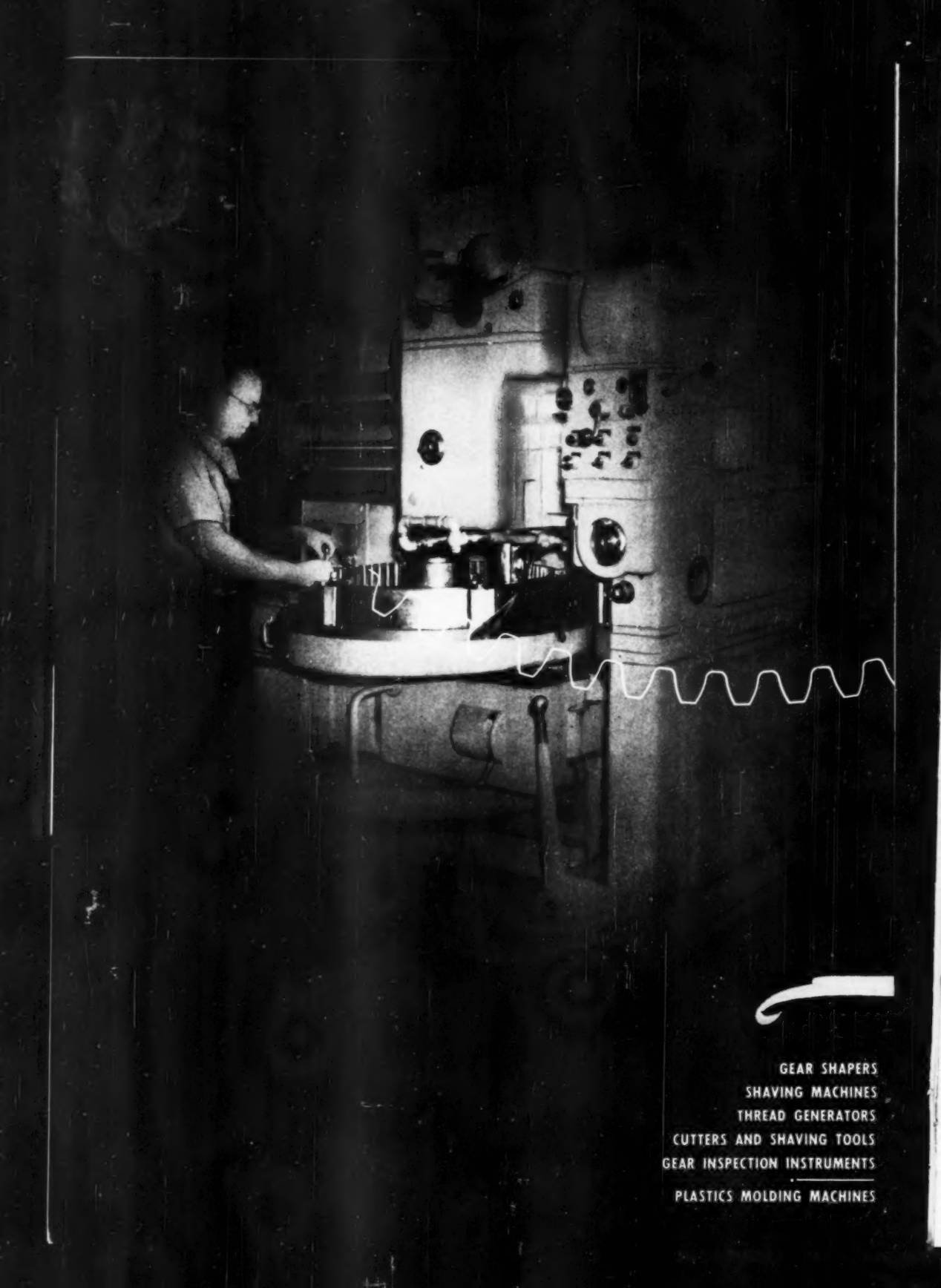
CINCINNATI GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

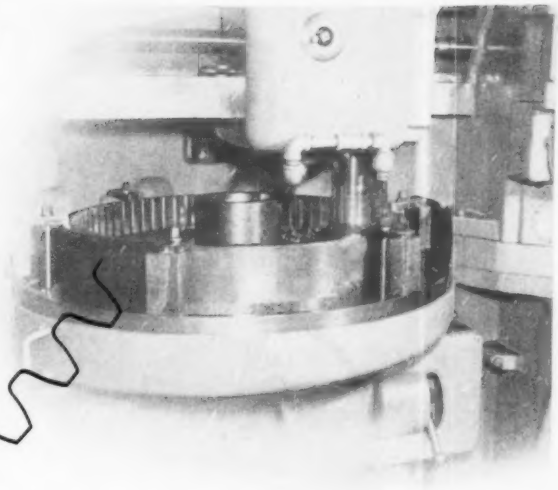
CENTER TYPE GRINDING MACHINES • CENTERLESS LAPPING MACHINES • CENTERLESS GRINDING MACHINES



GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS

PLASTICS MOLDING MACHINES

Record Time Rates on BIG GEARS



Cutting 6 hours production time to 3 hours floor-to-floor is mighty important in either production or jobbing-shop gear cutting. This is only one of the record performances of the new Fellows 36" Gear Shaper. Here is a machine ruggedly built for heavy cuts, which at the same time produces a smooth finish with a high degree of accuracy. This all-purpose Gear Shaper is adapted to cutting external and internal spur and helical gears up to 36" pitch diameter. Twelve quick-selective spindle speeds provide up to 300 strokes per minute... easy to operate, quick to set up. We would like to send you a brochure of interesting studies of typical production performances on this machine. Contact our nearest office.

Fellows

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The Van Norman No. 38 Miller gives you many cost-cutting advantages not found in any other miller of this type. The heavy, rugged column and sturdy ram are constructed to take all types of cuts including carbide milling. The massive cutterhead has a 10 HP motor driving the spindle, providing a 100% increase in power. Cutterhead speeds have been increased to 2000 RPM for high speed work.

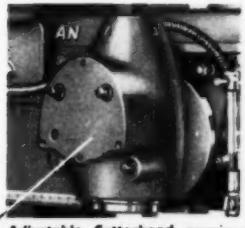
It will pay you to investigate the advantages of this New No. 38. Check its features against other millers and you'll find it gives you greater opportunities to cut costs and increase production. Write for information.

Production Work Hours . . .

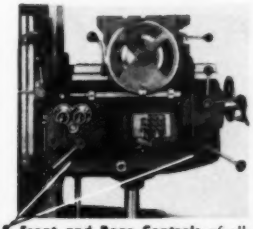
VAN NORMAN No. 38

RAM TYPE MILLING MACHINE

A Heavy-Duty Miller that provides many cost-cutting advantages



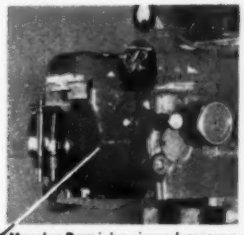
Adjustable Cutterhead permits horizontal, angular and vertical milling on *one* machine. Graduated in degrees for easy positioning.



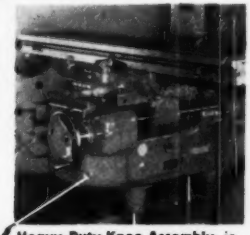
Front and Rear Controls of all power feeds can be operated from either position. Manual controls are also at front and rear.

Single Lever Electrical Control controls spindle, feed, and coolant. The same lever reverses spindle direction.

Load Meter is right before the operator's eyes . . . gives visual indication of the "percent of load" that the machine is being operated under.



Massive Ram is heavier and stronger than on other machines. It is reinforced throughout for ruggedness and long life.

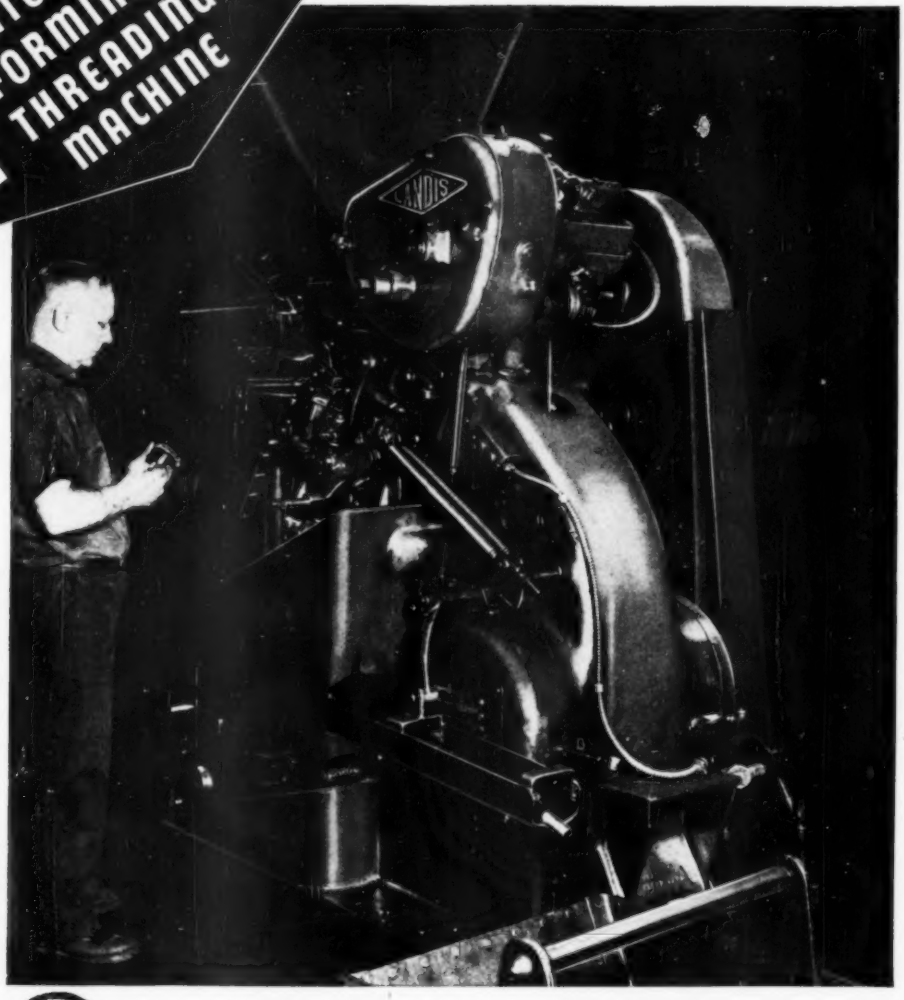


Heavy-Duty Knee Assembly, including table and saddle, is designed as an integral unit to provide maximum rigidity and accuracy.

VAN NORMAN COMPANY
SPRINGFIELD 7, MASSACHUSETTS

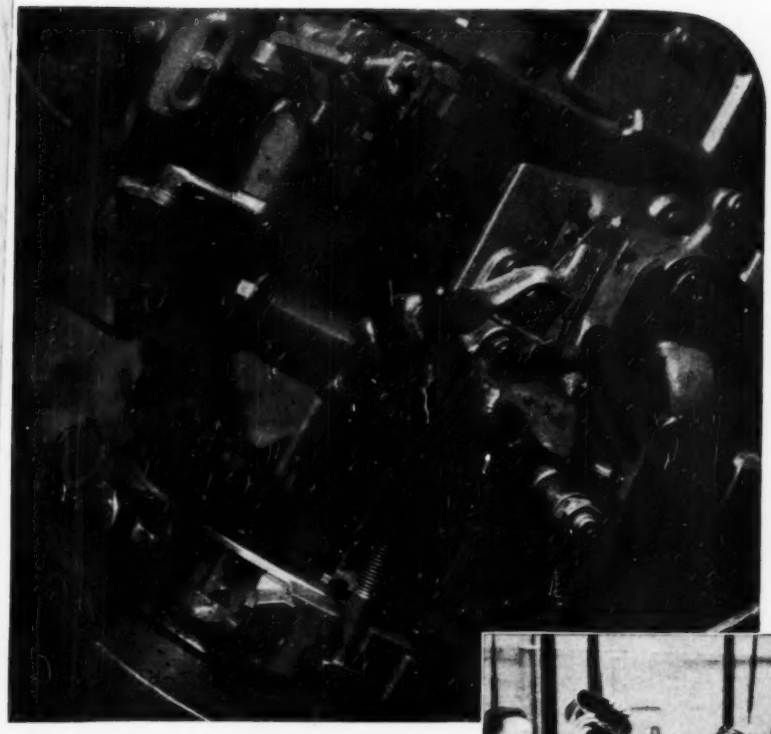
LANDIS
AUTOMATIC
FORMING &
THREADING
MACHINE

High Speed
964 3/4" BOLTS



LANDIS MACHINE CO.

PRODUCTION
PER HOUR, POINTED AND THREADED

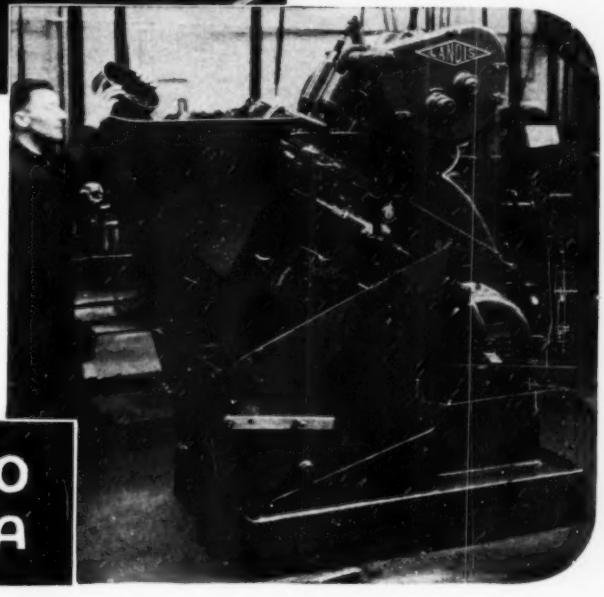


● The LANDIS Automatic Forming and Threading Machine is a fully-automatic machine designed to thread and point bolts, studs, cap screws, etc., from cold headed or hot forge blanks. The machine is built with semi-vertical spindles, thus saving space, and one man can easily operate a battery of eight machines.

Bolt blanks are dumped continuously into the hopper. The operation is then automatic until the finished bolts are ejected into an oscillating conveyor carrying them to a container.

Short set-up time is ideal for short runs—a change in thread length in 5 minutes, in bolt length in 10 minutes, in speed in 2 minutes—a complete change in diameter, pitch, thread length, and bolt length in 40 minutes.

Write for Bulletin E-70



MORE BOLTS PER HOUR, PER MAN

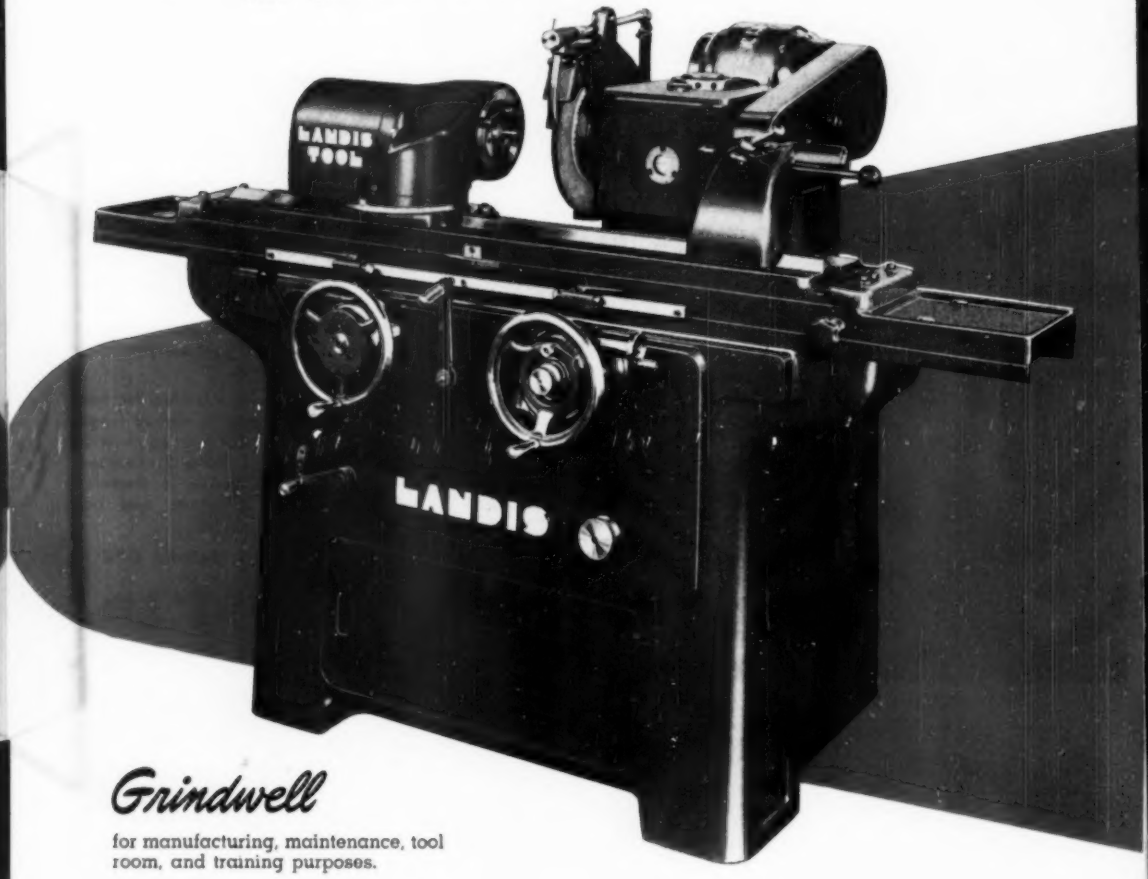
● Output varies from 750 to 1800 bolts per hour with the length and diameter of the thread. The Landis Automatic Forming and Threading Machine is illustrated producing:—on the left, pointed and threaded 3/4" machine bolts 4" long with a 10 pitch, Class 2 fit, 1" long thread at the rate of 964 bolts an hour in the plant of one of the nation's largest bolt manufacturers—in the center close-up, over 1,000 7/8" alloy steel cap screws per hour with 20 pitch, Class 3 fit threads—on the right, bolts, 5/8"-11 pitch with 1 1/2" thread length at 786 per hour, and over 10,000 threads per chaser grind.

WAYNESBORO
PENNA · U · S · A

New Low Cost Precision Grinder

LANDIS TOOL *Grindwell*

for general purpose cylindrical grinding



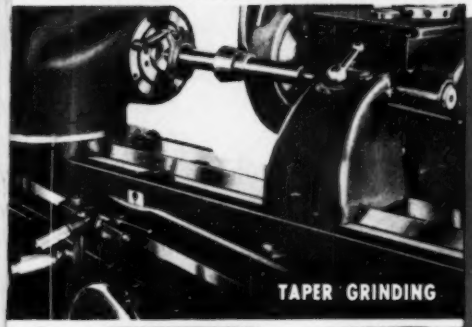
Grindwell

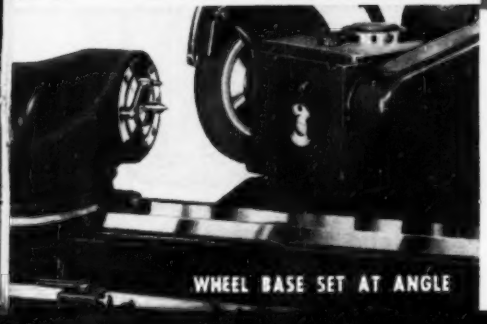
for manufacturing, maintenance, tool room, and training purposes.

EQUIPPED WITH MICROSPHERE BEARINGS

LANDIS TOOL

Precision Grinders





Typical Precision Grinding Operations

Grindwell

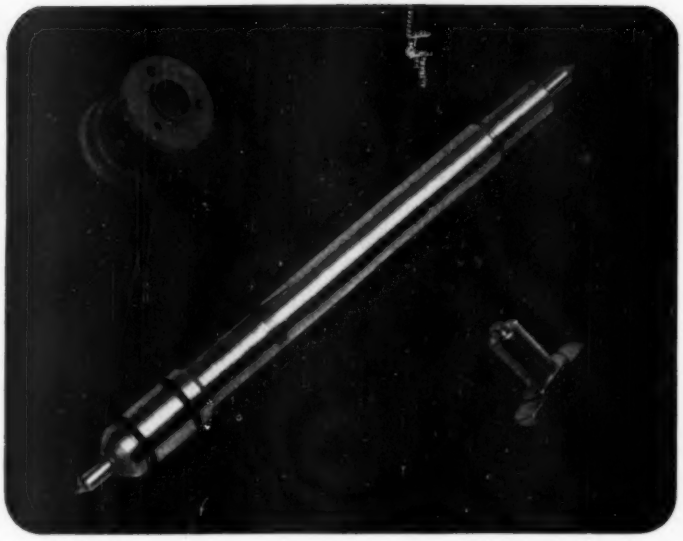
MONEY SAVING FEATURES

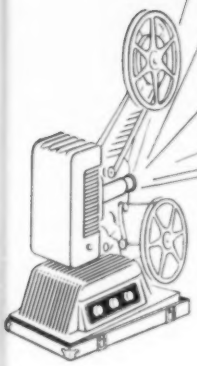
for
- Quick Set-up
- Flexible Operation
- Precision Grinding
- Fine Finishes

1. Microsphere wheel spindle bearings
2. Variable infinite speed headstock
3. 12" swing - 28" between centers
4. Live and dead spindle headstock
5. 12" diameter grinding wheel
6. Coolant pump and integral coolant reservoir
7. Two speed hand traverse
8. Precision coarse or fine wheel feed
9. Four speed power traverse
10. Swiveling headstock, wheel base and work table

For detailed information, specifications and extra equipment available, request Bulletin S-49

LANDIS TOOL COMPANY, WAYNESBORO, PENNA.





WHEN LASTING FINISH AND CLOSE TOLERANCE ENTER THE STEEL PARTS PICTURE . . . . .

When you machine steel parts from Republic ENDURO Stainless Steel Bars, there is no need for further protection of the fine, smooth surface finish. ENDURO is solid, long-lasting stainless steel—resistant to rust and corrosion all the way through.

This feature of ENDURO also permits manufacture of the finished part to close tolerances, so necessary in precision items like the movie projector stabilizer shaft, sprocket and camera lock pictured above. For these parts ENDURO type 430F—which, interestingly enough, is 91% as machinable as Bessemer stock—was used.

Add to these advantages the eye appeal, sanitation, ease of cleaning and heat-resistance of ENDURO—its *uniformity* of MACHINABILITY—its accuracy and fine finish in cold finished bar form—and you'll find many reasons for using it in YOUR PRODUCT.

Hot rolled bars, cold finished bars and wire now are available for prompt delivery. Write for details and prices.

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Republic ENDURO
FREE-MACHINING
STAINLESS STEEL

REPUBLIC STEEL

Other Republic Products include Carbon and Alloy Steels—Pipe, Sheets, Strip, Plates, Bars, Wire, Pig Iron, Bolts and Nuts, Tubing

13 REASONS FOR USING **HARPER** NON-FERROUS AND STAINLESS STEEL FASTENINGS

1. **Resistance to Rust and Corrosion**
2. **Resistance to High Temperatures**
3. **Non-Magnetic**
4. **Non-Sparking**
5. **Re-Usable**
6. **Attractive Appearance**
7. **Easy to Clean**
8. **High Strength**
9. **Long Life**
10. **Lower Ultimate Cost**
11. **Resistance to Fatigue**
12. **Easy to Plate or Finish**
13. **Resistance to Abrasion and Wear**

Only 1 Reason for Using Common Steel — LOWER FIRST COST

6000 ITEMS IN STOCK. The widest assortment of bolts, nuts, screws, washers, rivets and accessories in Brass, Bronzes, Copper, Monel and Stainless Steels available from one source . . . large quantities of each. Specials made to order from ample stocks of raw materials.

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EVERLASTING FASTENINGS

NO STRETCH!

Link-Belt Silverlink Precision Steel Roller Chain grasps the sprocket as positively as a gear . . . flexible—but without power loss.

NO SLIP!

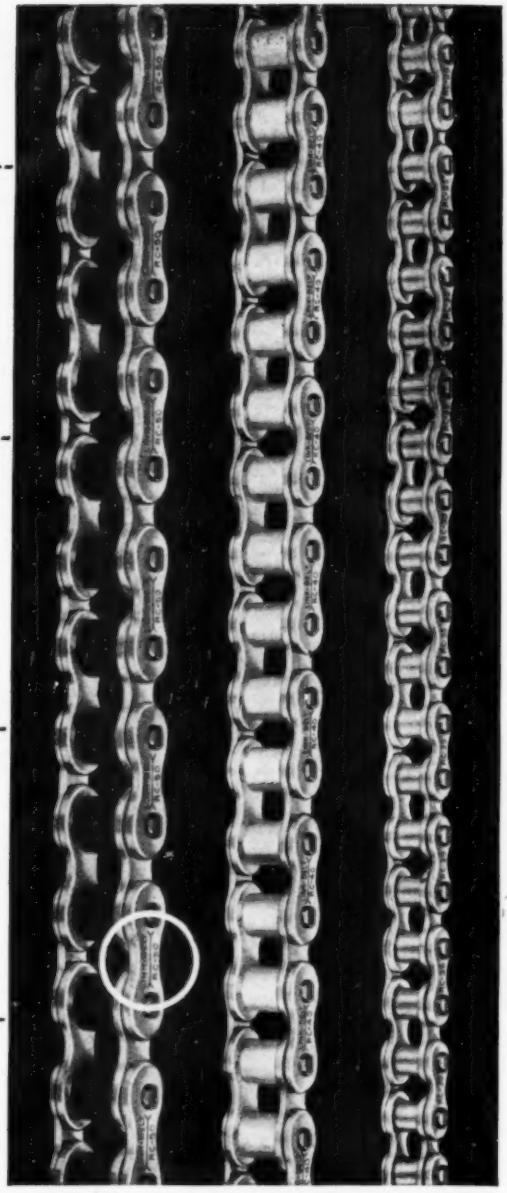
Link-Belt Silverlink Precision Steel Roller Chain runs slack enough for easy assembly, but is positive and unaffected by heat, cold or moisture.

NO SHOCK!

The rollers of Link-Belt Silverlink Precision Steel Roller Chain provide shock absorbing resilience.

NO DOUBT!

The name LINK-BELT on the sidebar is your assurance of quality chain. Ask for Data Book No. 1957-A.



LINK-BELT COMPANY

Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Houston 3, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices, Factory Branch Stores and Distributors in Principal Cities.

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LINK-BELT

ROLLER CHAINS & SPROCKETS

World's largest makers of Chains for Power Transmission and Conveying

"They're <u>both</u> good products

...but I'll take the one that can COUNT!"

ALL other points being equal, sales are often settled by one product's *extra* usefulness... such as the *ability to count*.

That's why a Veeder-Root Counter, *built into your product as an integral part*, is plainly good business . . . a hefty punch in today's slugfest for sales.

There are all kinds of Veeder-Root Counters, mechanical and electrical, to count in all units and terms . . . to enable your product to keep its own production records, prove its own service guarantee, and to give your customers protection in many ways against errors, delays, and waste. If there is *any* sales-building way in which your product can be equipped to count . . . then you can *count on Veeder-Root* to show you how. Write!

8-PAGE CONDENSED CATALOG shows Veeder-Root Counters for mechanical, electrical and manual operation. Write for a free copy.

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VEEDER-ROOT INC., HARTFORD 2, CONNECTICUT

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MACHINE READJUSTMENTS
OFF WITH THE OLD
ON WITH THE NEW
. . . and Start Grinding!
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Abrasives - Grinding Wheels - Grinding and Lapping Machines - Refractories - Porous Mediums - Non-slip Floors - Norbide Products - Labeling Machines

Increase Production with these new precise NORTON *Internal* GRINDING WHEELS

BECAUSE internal grinding wheels are small, they wear out quickly. Thus wheel changes are frequent and any reduction in wheel-change time can materially increase production. That's why the new Norton "precision-made" internal grinding wheels are so popular.

The grinding action of these new wheels is so uniform—not only in each lot but from lot to lot as well—that there's no lost time for machine re-adjustments when wheels are changed. The operator just slips off the worn wheel, snaps on a new one, starts grinding—***no fussing with feeds and speeds.*** He gets just the same grinding action that he had a few seconds before, or the day before, or the week before.

Produced by a radicaliy new, Norton-developed manufacturing process, these wheels have a uniformity in dimensions and in grinding action far ahead of anything previously obtainable in a ceramic product.

Available with All Norton Abrasives

W-1227

The advantages of this new NORTON manufacturing process are available with all Norton abrasives—ALUNDUM*, the sensational 32 ALUNDUM*, 38 ALUNDUM*, 57 ALUNDUM*, 37 CRYSTOLON* and 39 CRYSTOLON* abrasives.

Faster Service, Too

The new Norton manufacturing process with its electric kilns produces these improved internal grinding wheels in hours instead of days. This means improved delivery.

If you are not already cutting internal grinding costs with these new Norton wheels it will pay you to try them. See your Norton abrasive engineer or Norton distributor.

*Trade Mark Reg. U. S. Pat Off.

Precise Size

Grinding wheels made by the new Norton manufacturing process are dimensionally accurate within extremely close limits.

Precise Balance

Because of precision molding and precision burning, precise balance is inherent in the wheels—it's there to start with and it stays there as the wheels wear down.

Precise Grinding Action

The control methods of the new process have brought a new uniformity to grinding action—throughout the life of each individual wheel, from wheel to wheel and from lot to lot.

NORTON COMPANY, WORCESTER 6, MASS. • Warehouses in Five Cities • Distributors in All Principal Cities

Superlative Accuracy

Van Keuren ... MEASURING TOOLS

VK MICROGAGE SET M-21

For setting large micrometers and for checking large parts. Contains 1", 2", 3", 4", 5" and 6" microgages ⅞" in diameter and accuracy to +.000010" —.000005" per inch of length. This set provides 21 inches of dependable standards.

Complete in mahogany case $60.00.

VK Micrometer Squaring Fixture and 4" x 4" Precision Lap

Squaring fixture for ¼" or .270" dia. spindle	$15.00
Double surface 4"x4" precision lap	$15.00
¼"x1¼" anvil lap	$ 1.50
Kit, complete with instructions	$31.50

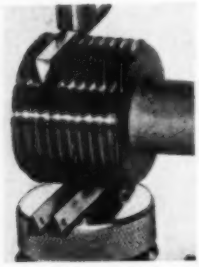
VK Double Surface Fused Quarts Optical Flats Are Always Accurate.

2"	Working Flat .000004"	accuracy $35.00
3"	Working Flat .000002"	accuracy $65.00
4"	Working Flat .000004"	accuracy $140.00

There is no perceptible change with time or temperature. They have a useful life 10 times that of glass flats.

VK 10" Diameter Double Surface Pack Hardened Steel Precision Bench Plate. — Two Reference Surfaces of Known Permanency.

Precision ground within .00005". It's a honey. The surfaces are so perfect that they can be tested with light waves. Price $125.00



VK ROOT DIAMETER WIRES

One set checks any 55° or 60° thread from 4½ to 64 threads per inch.

$10.00 each or $25.00 per set of three wires.

VK Standard Measuring Balls for Measuring Splines, Dovetails and Angles.

1" length and accurate to .00002". The set includes two balls each of the following sizes:

.050", .0625", .100" .125", .150", .1875", .200", .250", .300", .400", .500", .600", .700", .750", .800", .900", and 1.000".

Complete in mahogany case $185.00.

Accurate within .00025". It's a cinch to machine or grind 30°, 45°, 60° or 90° accurately with these tools.

VK 45° AND 60° SHOP TRIANGLES

Specifications and prices:

No.	Angle	Base	Height	Width	Weight	Price Each
1	45°	3⅞"	3⅞"	1½"	1½ lb.	$10.00
2	60°	3"	5"	1½"	1½ lb.	$10.00
3	45°	5½"	5½"	2"	4 lb.	$15.00
4	60°	5"	8½"	2"	5 lb.	$15.00

VK CATALOG AND HANDBOOK No. 34

This 208-page volume represents 2 years of research sponsored by the Van Keuren Co.

It presents for the first time in history a simple and exact method of measuring screw threads and worms with wires.

It tells how to measure gears, splines and involute serrations. It is an accepted reference book for measuring problems and methods.

Copies free upon request

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Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carbalay Plug Gages • Carbalay Measuring Wires

Hardened Tool Steel Vees

60 ROCKWELL C

protect the carriage ways of

"AMERICAN" PACEMAKER LATHES

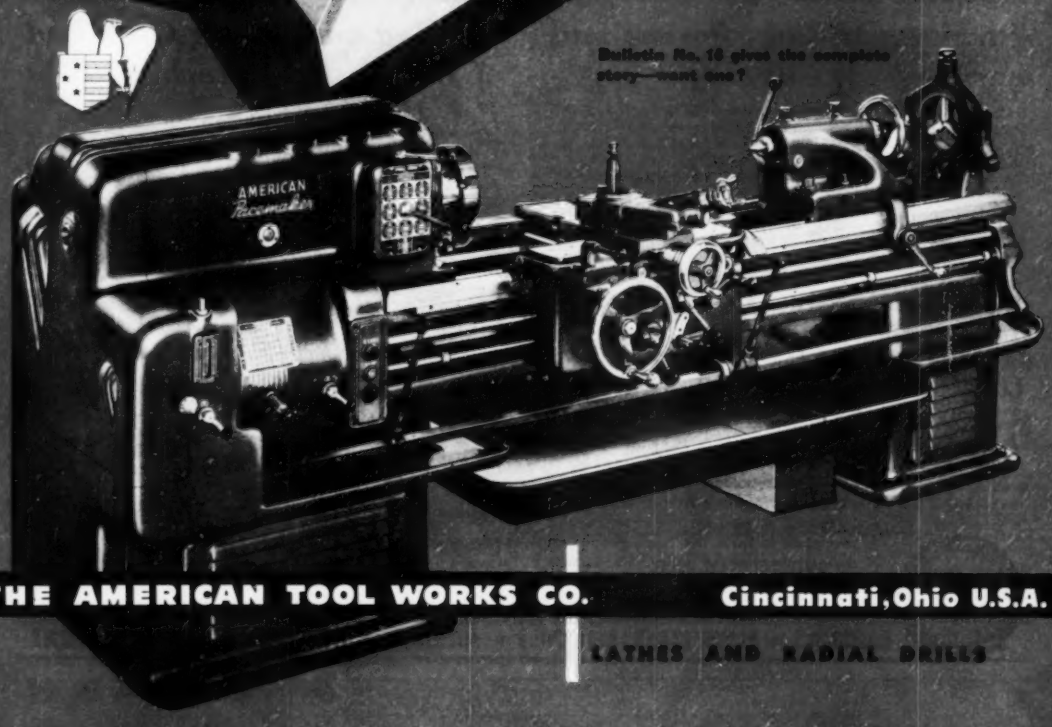
They are standard equipment on all "AMERICAN" Lathes

These hardened vees are made of solid tool steel and ground to gauge tolerances for interchangeability should replacement ever be required.

After hardening, the metallurgical structure is stabilized by cold treatment at minus 108° Fahrenheit to prevent twisting or warping.

This feature is but one of the outstanding advantages offered by the new "AMERICAN" Pacemaker Lathe.

Bulletin No. 10 gives the complete story—want one?



THE AMERICAN TOOL WORKS CO. **Cincinnati, Ohio U.S.A.**

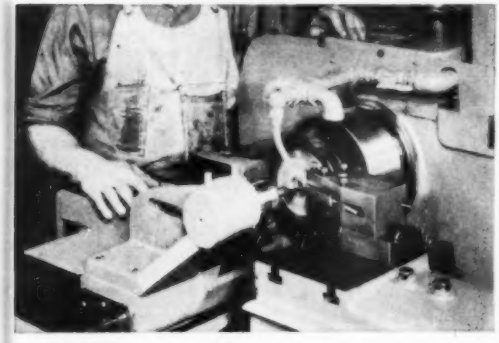
LATHES AND RADIAL DRILLS

HOW TO COMBINE OPERATIONS ON SUNDSTRAND AUTOMATIC LATHES . . .

To Lower Machine Investments And Machining Costs

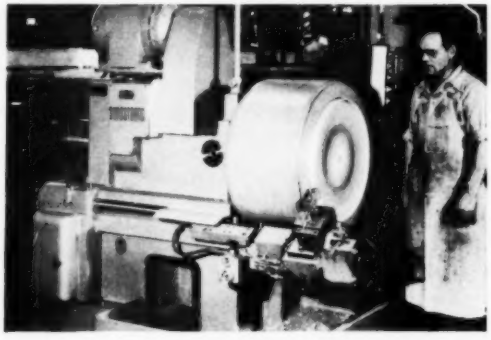
Here are six good examples of the use of multiple tooling and automatic cycling on Sundstrand Automatic Lathes. The prominent manufacturer who installed these six, and other automatic lathes, found he could do more work with fewer machines by using Sundstrand Automatic Lathes and "Engineered Production".

Whether your turning problem is a mass production job running into thousands of pieces . . . a short run of as few as 25 pieces . . . or a special turning job, Sundstrand engineers will show you how it can be handled to advantage on automatic lathes with quick cycle changeover. There is no obligation for this service.



Turning, Drilling, Boring and Facing Gear Blanks

In two operations a gear blank part is core drilled, finish bored, turned on the O. D. and hub and faced on both sides. In the first operation, which is illustrated above, tools for turning the O. D. are mounted on front carriage which also carries the core drill for drilling the center hole. Cross-feed of the rear slide tool faces back of part. Production is 90 per hour. The part is reversed for second operation where the hub is turned and center hole finish bored by tools on the front carriage. Rear slide tools face the hub and front gear face. Production is 134 per hour.

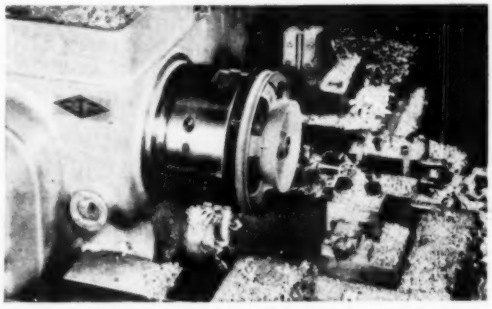


Turning and Facing Open End of 85 Washing Machine Tubs Per Hour

The Sundstrand special short bed lathe illustrated above is used for turning and facing the open end of a washing machine tub. It has a special tool block guided by a roller that rides against the O. D. of the tub and moves the tool to conform with any irregularities in the tub diameter. The short bed permits easy end loading and unloading to maintain a production of approximately 85 pieces per hour..

Boring, Facing, Forming and Chamfering Clutch Pulleys in One Automatic Cycle

Here's another Sundstrand Automatic Lathe tooled to simultaneously bore, face, form and chamfer an aluminum clutch pulley. The front carriage mounts the boring bar which bores and faces the center hole. Also, mounted on front carriage are the tools for boring and chamfering the inside of the drum. A form-tool is used on the cross-feeding rear slide to form the "vee" groove on the periphery of the pulley. Production is 69 pulleys per hour.

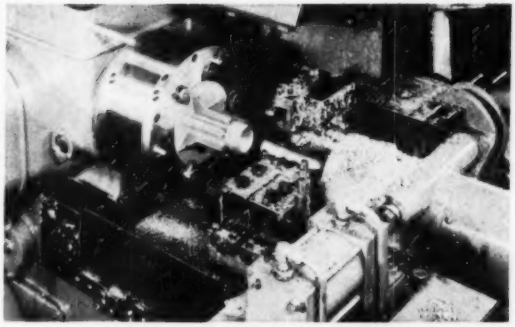


SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS, U.S.A.

RIGIDMILS • FLUID SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

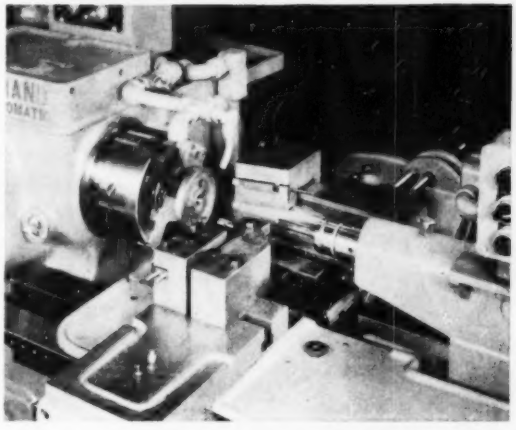
6 Surfaces Machined in One Automatic Cycle

This washing machine damper is turned, rough and finish bored, faced and chamfered in one automatic cycle with a Sundstrand Automatic Lathe. The front carriage mounts 2 tool blocks, each carrying one tool. The first tool turns a locating spot on the web for subsequent operations. The second tool turns the hub O.D. The boring bar, also mounted on front carriage, has automatic indexing between the rough and finish boring cuts. The tool block on rear slide carries two tools, one of which faces and chamfers the hub — the other faces the end of the web structure. Production is 55 pieces per hour.



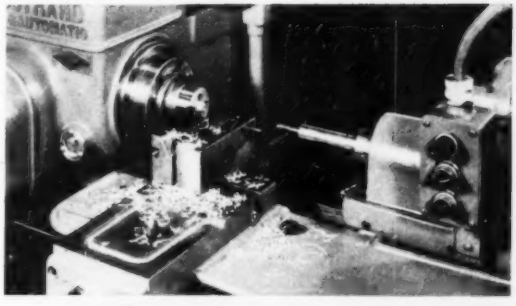
Combining Multiple Operations On Gear Blanks for Maximum Production

In two more operations another gear blank has the O.D. turned, both sides faced, the hub turned, faced, undercut and chamfered and the center hole bored and reamed. In the operation illustrated, the O.D. is turned, the back side is faced and the center hole bored and reamed. The front slide has two tools for turning the O.D. and a boring bar to bore the center hole. The rear slide has two tools for facing the back of the gear. A special motor driven reaming unit is mounted on an air operated slide. Production is at the rate of 70 pieces per hour. The second operation on another Sundstrand Automatic Lathe includes turning, facing, chamfering and undercutting the front side. A single tool on the front slide turns the hub O.D., while two tools on the rear slide face the gear and hub faces, and a third tool chamfers the hub O.D. An overhead slide has one tool which feeds in to undercut the hub diameter. Production is 87 pieces per hour.



Turning, Boring and Tapping Pump Pulley

The O.D. of a zinc die cast pump pulley is turned, and the root diameter is bored and tapped on the Sundstrand Automatic Lathe illustrated. The front slide mounts one tool for turning the O.D. and a boring bar for boring root diameter. A special motor driven tapping unit is mounted on an air operated slide for movement in and out of tapping position. The production is approximately 85 pieces per hour.



How to Lower Costs With Sundstrand Automatic Lathes

This 44-page booklet, crammed full of technical data and production information, shows how to apply multiple tooling to countless turning jobs. Short-run, mass production and special turning jobs are all included. Write for your copy today. Ask for bulletin 185.

SUNDSTRAND
MACHINE TOOL COMPANY
2533 Eleventh St. • Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

What does it stand for
ON A TAP?
P&W - PRATT & WHITNEY,
of course — a name that every worker in metal associates with precision production.
Think what it means on small but critically important precision tools like taps:
• tap steel made to exacting P&W specifications and subject to rigid inspection in our large and completely equipped metallurgical laboratories.
• tap design, heat-treatment, finish, inspection that assures the very finest quality and dependability of performance.
• *tap engineering* service that goes all the way through to assure the right tap and tapping procedure for the job, the lowest cost per tapped hole, whether the tap is standard or special. P&W Taps cover all types and sizes.
Wouldn't it be a shrewd move on your part to standardize on P&W Taps? Try a few and see. Our 444-page Small Tool Catalog contains complete listings.
Pratt & Whitney
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WEST HARTFORD 1, CONNECTICUT
Taps

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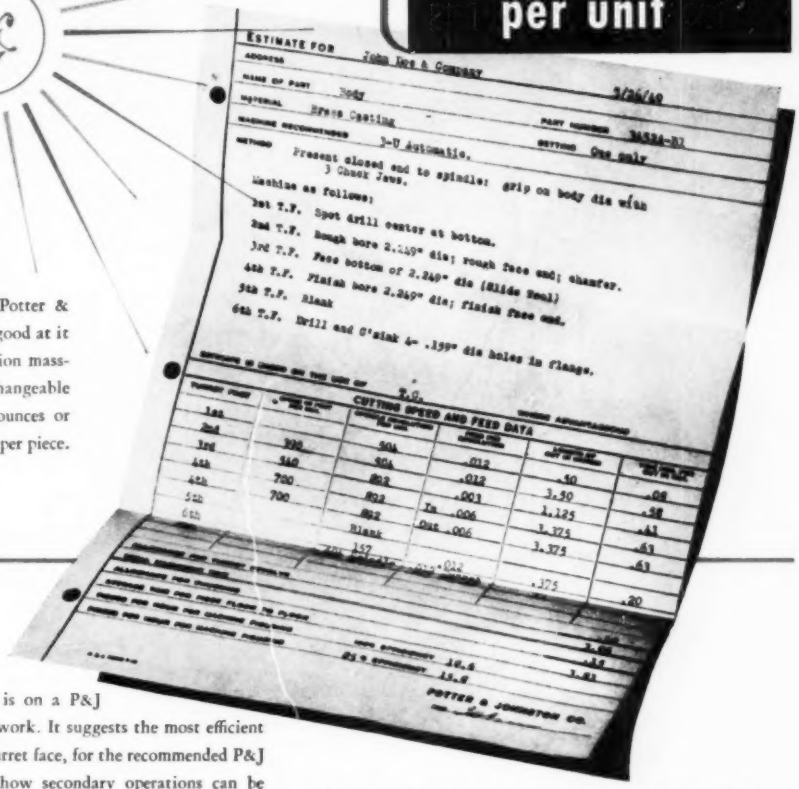
for better work

and more of it

at lowest cost per unit


ESTIMATE FOR
John Ice & Company
3/26/49
Brass Casting
3-U Automatic.
One only
Present closed end to spindle; grip on body dia w/an
3 Chuck Jaws.
Machine as follows:
1st T.F. Spot drill center at bottom.
2nd T.F. Rough bore 2.159" dia; rough face end; chamfer.
3rd T.F. Face bottom of 2.249" dia (Slide Tool)
4th T.F. Finish bore 2.249" dia; finish face end.
5th T.F. Blank
6th T.F. Drill and C'sink 4- .139" dia holes in flange.
T.U.
CUTTING SPEED AND FEED DATA
POTTER & JOHNSTON CO.

If there is one thing Potter & Johnston engineers are good at it is tooling up for precision mass-production of interchangeable parts, whether a few ounces or several hundred pounds per piece.

Proof, if you want it, is on a P&J Estimate Sheet for *your* work. It suggests the most efficient tooling, turret face by turret face, for the recommended P&J Automatic. You'll see how secondary operations can be engineered into the main setup to reduce machining time . . . how unnecessary work-handling can be eliminated . . . how one man can operate two or more P&J Automatics, thereby gaining additional savings in divided labor costs. It forecasts the entire operation in actual cost-and-time figures.

Such an Estimate Sheet is yours without obligation. Just send in prints — better yet, a sample of the job itself.

Potter & Johnston Company

Pawtucket, R. I.

subsidiary of Pratt & Whitney Division Niles-Bement-Pond Company

P&J AUTOMATICS...

tooled for Production - Speed - Economy at Production Tooling Headquarters

the end of horse and buggy days

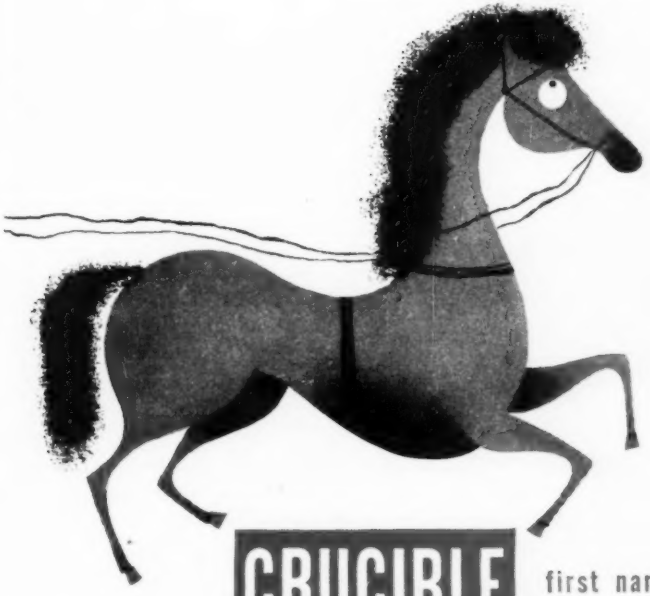
for stainless sheet and strip

Automobiles were once designed as horseless carriages—even to the dashboard socket for a needless whip. Stainless steel production, too, once struggled thru horse and buggy thinking. More power, heavier rolls, more care in surface finish —and stainless sheet and strip came forth a step-child of carbon steel methods. Today's modern strip mills have changed this, giving stainless production new concepts of quality.

CRUCIBLE, one of the pioneers in stainless steel, has gone still further. Now, *for the first time*, hot and cold rolled stainless steel is made a *specialty product*, by specialty production methods, in a mill built specifically for this purpose—in widths from ½" to 50" inclusive, and in all gauges, grades and finishes.

This is more than merely another source of supply. For, with this new mill at the Midland Works and the Trent Tube Co. joining the organization, CRUCIBLE can now supply you with *every* form of stainless. And, in sheets, plates, strip, bars, tubing, forgings, wire and castings, you can rightly expect the best that modern facilities and generations of *specialty product* leadership can provide.

CRUCIBLE STEEL COMPANY OF AMERICA, 405 Lexington Ave., N. Y. 17, N. Y.
Branches, Warehouses and Distributors in Principal Cities



CRUCIBLE first name in special purpose steels

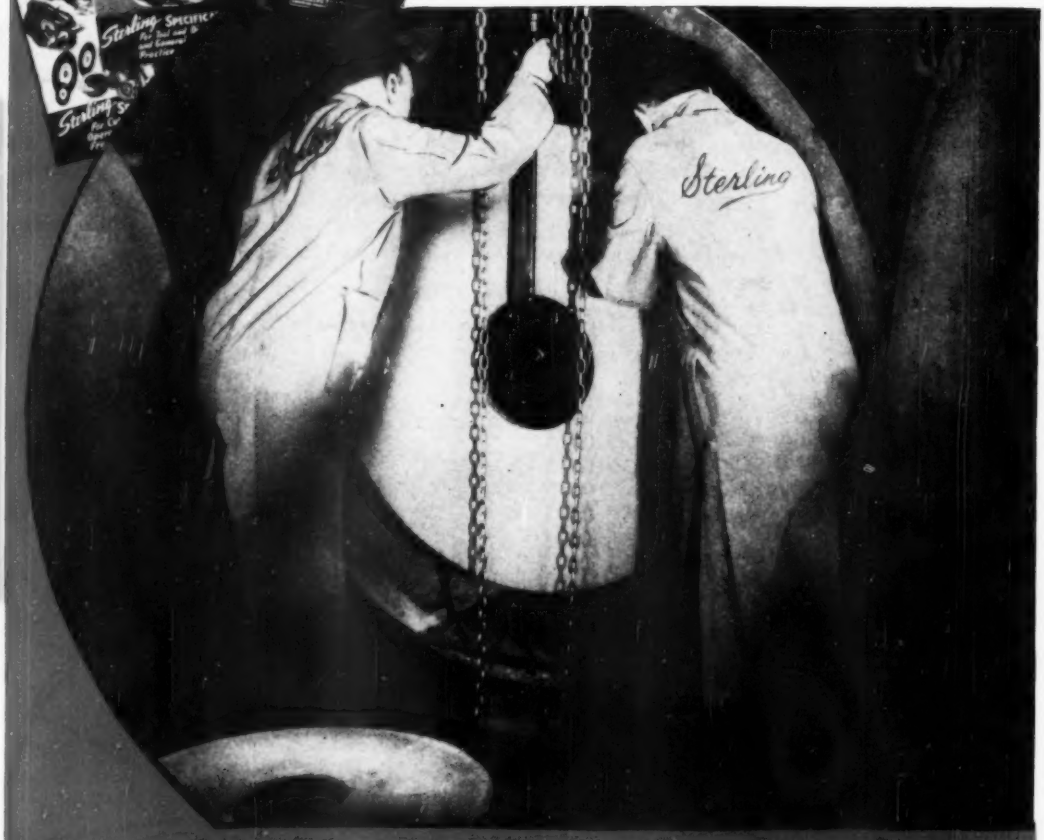
hot and cold rolled **STAINLESS SHEET AND STRIP**

STAINLESS • HIGH SPEED • TOOL • ALLOY • MACHINERY • SPECIAL PURPOSE • STEELS

These folders are ready for distribution. Send for your copies.

STE

WHERE ELECTRONICS THAT GUARANTEES



STERLING'S RESEARCH AND DEVELOPMENT TECHNIQUE

TWO workers are shown above, placing a Sterling Grinding Wheel in position to be tested in an electronically controlled machine. Here, it will be spun far beyond all safety limits to insure a wheel that can be used with confidence at ordinary grinding speeds.

"THE WHEELS OF INDUSTRY"
STERLING
GRINDING WHEELS

STERLING

INSURES WHEEL TESTING POSITIVE SAFETY STANDARDS

STERLING eliminates the human element when testing your "Wheels of Industry". Electronically controlled machines, set to pre-determined speeds, spin the wheels far beyond any stress they will encounter on your grinding jobs . . . insure maximum safe operation.

Identical care is exercised throughout the entire Sterling organization from the time your wheel formula is received from the Sterling engineer until it is delivered as a finished abrasive tool, ready to solve your grinding problem.

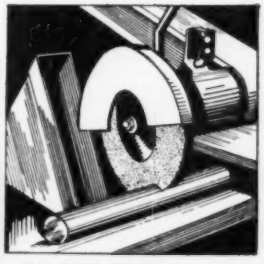
This unusual attention to detail is but one of many features of Sterling's New Research and Development Program. It has, as its basic function, the manufacture of the finest grinding wheels you have ever used. Other production executives are obtaining faster, better production from the use of Sterling Grinding Wheels. You can enjoy similar results in your department. A Sterling engineer is on call . . . . may we send him today ?

STERLING RESEARCH AND DEVELOPMENT IN ACTION

FIRST STEP - - - What grinding wheel will cut this bar fast and accurately enough that no second grind for finish will be necessary?

SECOND STEP - To find the answer, Sterling technicians take a sample of the bar to be cut. Combining its study with results of previous jobs suggests the wheel to use.

THIRD STEP - - - From the recommended formula, a test wheel is handmade under strict laboratory control. Here, technical analysis becomes the finished wheel.



FOURTH STEP - On the job, the Sterling Cut-Off Wheel cuts faster, produces more pieces, and lasts longer because it is backed up by definite research and development.

THE STERLING GRINDING WHEEL DIVISION

of

THE CLEVELAND QUARRIES CO.

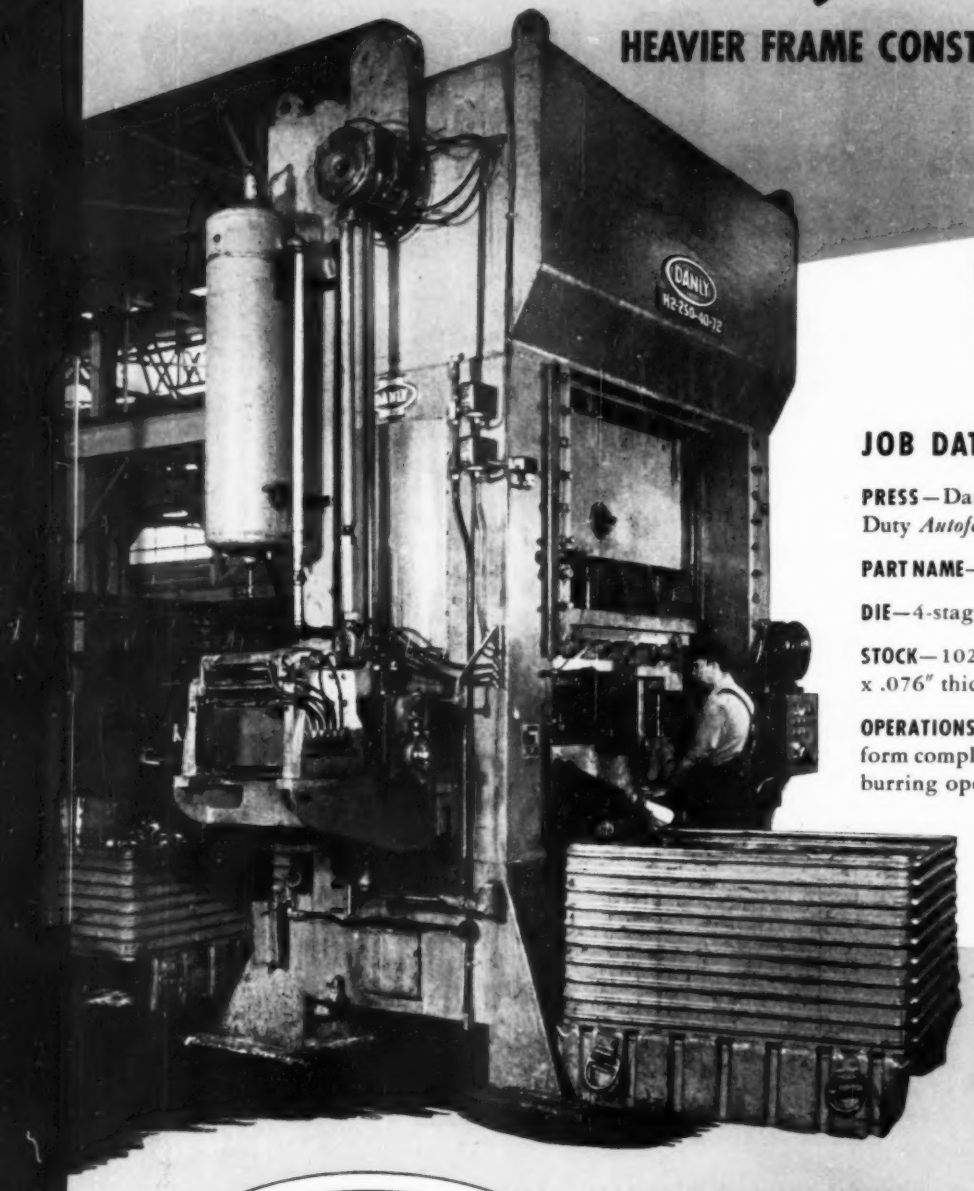
TIFFIN, OHIO

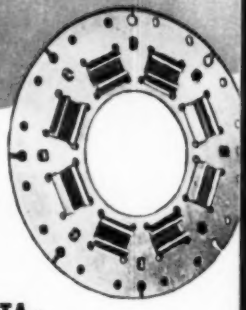
Since 1885, Manufacturers of "The Wheels of Industry"

Branches: Boston, Chicago, Cleveland, Detroit, Los Angeles, Philadelphia, New York. Distributors In All Cities.

FASTER SPEED OF *Autofeed* PRESS

HEAVIER FRAME CONSTRUCTION





JOB DATA:

PRESS—Danly 250-ton Heavy Duty *Autofeed*

PART NAME—Clutch driven plate

DIE—4-stage progressive

STOCK—1020 CRS, 6⅛" wide x .076" thick, coil..

OPERATIONS—Blank, pierce and form complete. (No subsequent burring operation required)

This Danly 250-ton Heavy Duty Autofeed press produces both finished stampings shown on the inspection table (opposite page). Formerly, each stamping was made on a separate press.

DANLY

DANLY MACHINE SPECIALTIES, INC.
2100 S. 52nd AVENUE, CHICAGO 50, ILLINOIS

MECHANICAL PRESSES

INCREASES PRODUCTION...TRIPLES DIE LIFE

REDUCES VIBRATION AND BED DEFLECTION

PERMITTING LONG RUNS AT HIGHER SPEED

THIS AUTOMOTIVE stamping was formerly produced on a press of the same tonnage at 20 strokes per minute. Now, on a Danly Heavy Duty *Autofeed* press, the speed has been tripled to 60 strokes per minute. In addition to increasing production, three times as many parts are produced between die grinds, and burring has been substantially reduced. Quality has been improved while reducing direct production costs.

All Heavy Duty *Autofeed* presses are designed throughout for faster, automatic stamping of parts. The entire frame is constructed heavier for the rated capacity of the press, reducing vibration at higher operating speeds. The result is longer uninterrupted runs, better die performance and higher product quality.

Production Increased—Heavier frame construction permits taking full advantage of automatic feed through progressive dies completing numerous operations in one press. Handling is reduced—one press does the work of several presses.

Maintenance Costs Reduced—The Danly air-cooled, air-operated clutch and brake operate for prolonged periods without maintenance. Friction discs responsible for clutching and braking action are not subjected to the disintegrating effects of high temperatures.

Automatic lubrication flushes all bearings in crown and slide, including gibs, substantially increasing the prime life and top performance of the press.

EXCLUSIVE DANLY FEATURES POINT TO LOWER STAMPING COSTS

Die Tryouts Facilitated—Special Danly controls and unusual clutch sensitivity inherent in Danly design permit closer, more accurate "inching" during die tryouts. This saves time and adds safety in getting dies spotted and in production.

Inspection operation showing both clutch plates and lamp mounting brackets in place on gages. These parts are alternately produced on the Danly Autofeed Press.

WRITE FOR COMPLETE INFORMATION

Consult Danly Engineers for the most efficient presses to meet any requirement from 50 tons up. Danly Straight-Side, Single Action, Double Action and Gap Frame Presses are also setting production records throughout industry today.

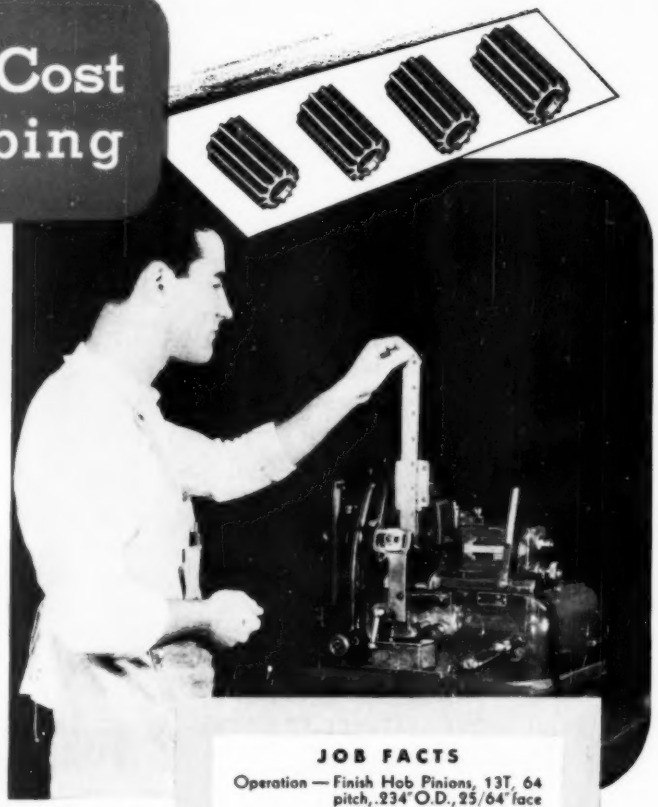
Write now for catalog on Danly presses which can lead to real cost savings in your press shop.

AND PRESS EQUIPMENT

OVER 25 YEARS OF DEPENDABLE SERVICE TO THE STAMPING INDUSTRY

Low Cost Hobbing

SMALL, FINE PITCH GEARS IN TOUGH STEEL



With

BARBER-COLMAN

No. 1-½ AUTOMATIC HOBBING MACHINES

Low initial investment, minimum tool cost, long tool life, continuous automatic operation — these are features of the No. 1-½ Automatic Hobbing Machine which provide exceptional economy for producing small fine pitch gears.

These 13 tooth pinions are hobbed from tough, ball bearing steel, 180-230 Br. Ground hobs are used, producing 390 pinions per sharpening. Tooth interference with a master is .0005". Hob life is approximately 3120 pieces. Tool cost averages only about one cent per pinion.

Check your small fine pitch gear requirements with Barber-Colman Engineers. Let them demonstrate the economy and production advantages of the No. 1-½ Machine.

JOB FACTS

Operation — Finish Hob Pinions, 13T, 64 pitch, .234" O.D., .25/64" face width.
Machine — No. 1-½ Automatic Hobbing Machine
Hobs — B-C Ground, 7/8" O.D., 64 pitch.
Feed — .072"/rev. Speed — 484 RPM
Fl-to-Fl — 75 seconds per pinion
Hob Life — 390 pieces per sharp.
Tolerances — tooth interference with master, .0005".

Barber-Colman Company

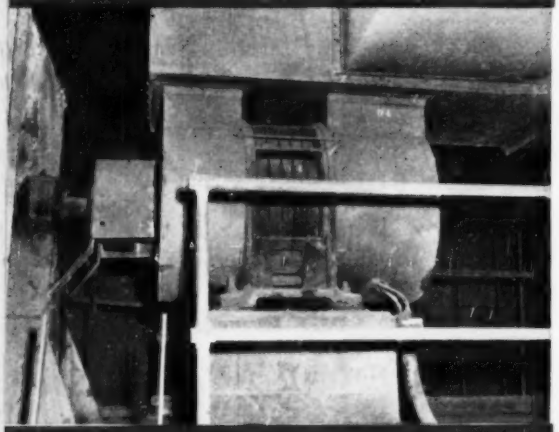
GENERAL OFFICES AND PLANT, 1129 LOOMIS ST., ROCKFORD, ILLINOIS, U. S. A.

Get Yours Today!

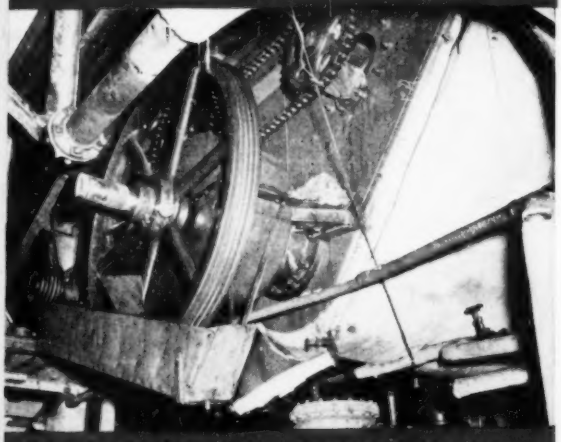
This new bulletin describes production figures and specifications on fine hobbing applications. Write for Bulletin 1129.

BARBER COLMAN

FEED WATER PUMP . . . 200° F.



AIR FAN . . . OVER 300° F.



SUGAR MIXER . . . 150° TO 250° F.

Now, one grease withstands both heat and water

BEARING LUBRICATION posed a continual problem for a midwest sugar-refining company.

The ball bearings in feed-water pumps operate around 200° F. and, in addition, are exposed to the washing action of water. The ball bearings in air fans have operating temperatures over 300° F. The shaft bushings in a sugar mixer operate at around 200° F. and are subjected to continuous attack by the sugar-water mixture.

These conditions proved too severe for conventional greases. Bearings failed frequently. Maintenance costs were high. A Standard Oil Lubrication Engineer tackled the problem. He suggested the use of Stanolith Grease—a lithium soap product with the unusual ability to withstand both high temperatures and the washing action of water.

The switch to Stanolith has eliminated bearing maintenance for the feed-water pumps. Bearings in the air fans have been kept in almost continuous operation. On the most difficult job of all, Stanolith has prevented bearing wear and seizure troubles in the sugar mixer. Costly shutdowns and repairs of the mixer have been eliminated.

Where both heat and water interfere with lubrication of your equipment, try Stanolith Grease. A Standard Oil Lubrication Engineer will be glad to give you more information about this versatile product.

Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Ill.

Stanolith Grease

STANDARD OIL COMPANY (INDIANA)

STANDARD

● Shown above are several of the many different parts produced in stamping operations by the Streicher Die & Tool Co., Ypsilanti, Michigan. This company has made important savings by standardizing on Stanostamp C Compound for all of the plant's stamping jobs.

How to lick a stamping problem

THE REMOVAL of stamping compound from finished parts proved extra troublesome to the Streicher Die & Tool Co., Ypsilanti, Michigan. The problem was put to a Standard Oil Lubrication Engineer.

At his suggestion, stamping operations were switched to Stanostamp C Compound. This product formed stable emulsions, was easily removed from finished parts. To this saving of time and labor, Stanostamp C added still another economy . . .

Company expansion brought a greater variety of stamping jobs. Operators found that they could handle all of the various jobs with Stanostamp C simply by varying the concentration of compound-water mixtures. The versatility of Stanostamp C eliminated the cost and inconvenience of stocking special die lubricants.

Why not utilize the Standard Oil service employed so successfully by the Streicher Company? The combination of expert engineering and high-quality products can help you solve a specific problem or gain worthwhile savings. Write for this service, today.

Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

Stanostamp Compounds

STANDARD OIL COMPANY (INDIANA) STANDARD

BETTS
BORING and TURNING MILLS

MADE IN SIZES FROM 100" UP TO ANY REQUIREMENT

BETTS 20' HEAVY DUTY VERTICAL BORING AND TURNING MILL

Among Heavy Machine Tools built by Consolidated are . . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
BORING, DRILLING AND MILLING MACHINES
DRILL AND TOOL GRINDERS
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER SPECIAL MACHINES

Betts Heavy Duty Boring and Turning Mills are general purpose tools of simple, rugged design particulary adapted to heavy continuous operations requiring a high degree of accuracy combined with power. Among the outstanding features that have made Betts Mills leaders in their field, is their type of table mounting that insures positive concentricity. They are built in a size range from 100" swing up to any size to meet your requirements.

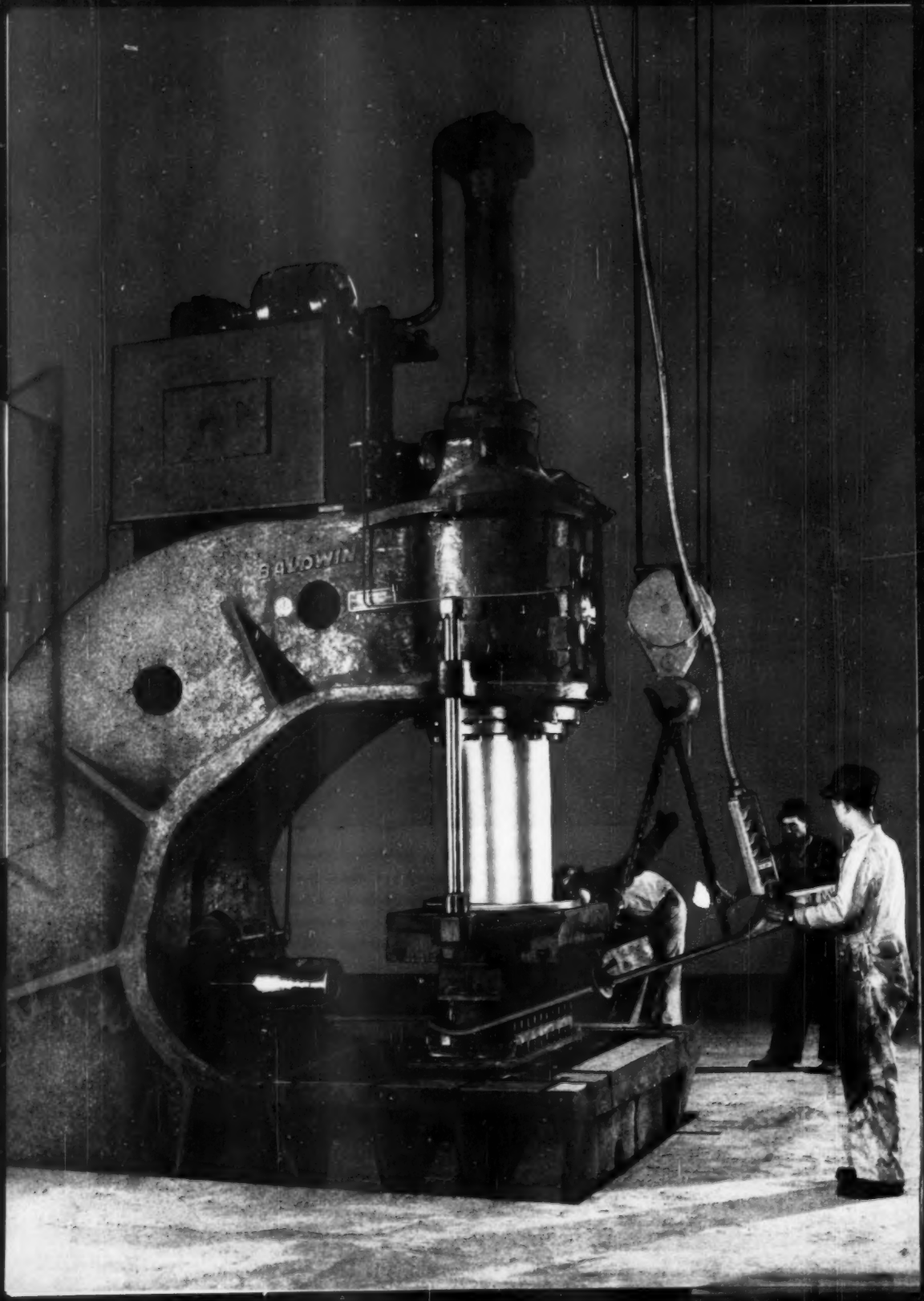
Full information covering any size Betts Boring and Turning Mill in which you are interested will be furnished upon request.

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION
ROCHESTER 10, NEW YORK


BALDWIN

BALDWIN PRESS AT NATIONAL TANK COMPANY

does *many* jobs *well*

Aiming at expansion of both the scale and the scope of its operations, National Tank Company of Tulsa, Oklahoma, recently installed a new Baldwin 400-ton gap type press.

If past experience is any guide, this press will quickly earn the blue ribbon as the most versatile, profitable and helpful piece of equipment in the shop. It handles crimping, flanging, straightening and joggling operations rapidly and precisely, helps to expedite the flow of orders through the shop, and produces at a rate that spells better profits for the owner.

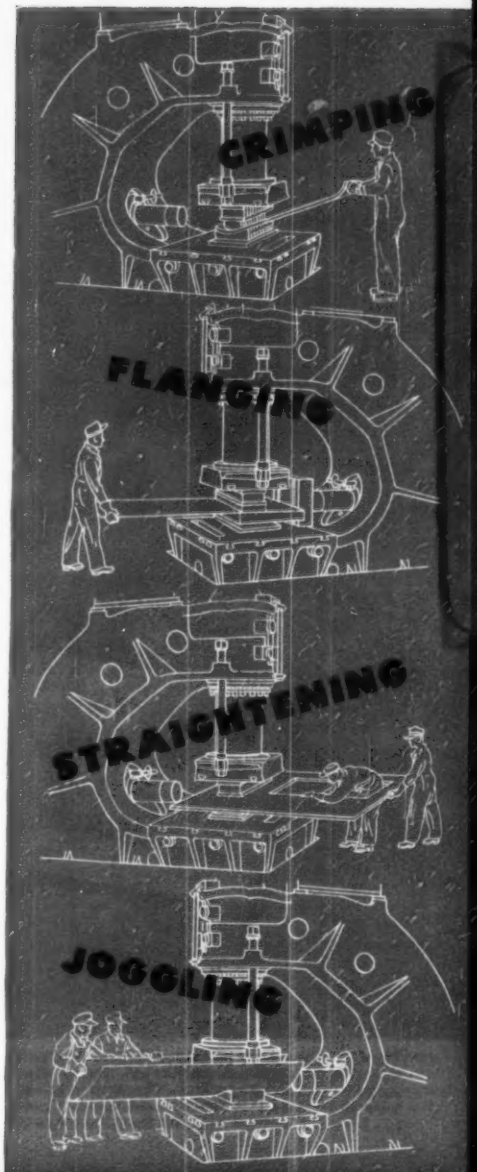
Baldwin's Hy-speed Hydraulic System adds a big plus to the performance of every Baldwin press. The speed of the ram in every portion of the stroke, as well as the length of "dwell," is under continuous and complete operator control. An important refinement is found in the packing, which automatically adjusts itself to the pressure to which cylinder and ram are subjected. Re-packing can be done from the outside, without any necessity for major dismantling. The safety of the operator is given top consideration, with automatic stoppage of the slide in case of power failure—complete auxiliary manual control even in the cases of semi-automatic or automatic operation . . . and instant stoppage in case of emergency, and return of ram to top position

Details are given in Bulletin 285, sent on request. A representative will be glad to consult with you, and work out the type of press best suited to your needs.

The Baldwin Locomotive Works, Philadelphia 42, Pa., U.S.A. Offices: Boston, Chicago, Cleveland, Houston, New York, Philadelphia, Pittsburgh, San Francisco, Seattle, St. Louis, Washington. In Canada: Baldwin Locomotive Works of Canada, Ltd., Toronto, Ontario.

BALDWIN BLW THE BALDWIN GROUP

HYDRAULIC PRESSES



The Word Is Getting Around: THESE TIME DRASTICALLY—

Here's picture-story of how 43% reduction in floor-to-floor time was accomplished on this job. Simple vise type fixture holds 4 workpieces at a time. Operator takes only few minutes to set up for *Mono-Lever* controlled automatic cycle . . . for rapid traverse to point of cut, feed through cut, rapid traverse reverse to starting point and stop for reload. Note that the operator engages *Mono-Lever* control *once* — at start of each cutting cycle. No other attention is necessary. While machine is running operator inspects and burrs finished pieces.

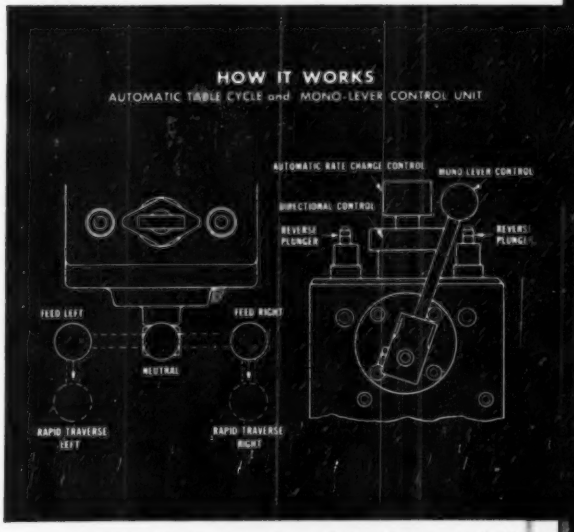
MACHINES SLASH IDLE 43% GAIN ON THIS JOB

YOU too, can make big time savings in the floor-to-floor cycle on milled parts. Other plants are doing it *now* — reporting savings of 16—31—43—96%. How? With new Kearney & Trecker knee-type milling machines with *Mono-Lever* control and automatic table cycle.

It will pay you to investigate these machines. See how a single lever controls all table movements . . . how *Mono-Lever* control works independently or with automatic table cycle to reduce idle cutter time — to turn out jobs faster, better — to stop operator fatigue. See how these versatile knee-type machines give you the productive capacity of bed type equipment.

Equally important — there's a machine to fit your jobs. You neither *over-buy* nor *under-buy* — you buy *right* when you choose from 56 machines in this line.

For startling facts about these machines as applied to your milling work, consult a Kearney & Trecker Sales Representative today. Schooled in the "know-how", he's at your service. Contact him or write Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wis.



THINK OF IT! Now you can have all the advantages of this great cost-cutting feature plus the all-around versatility of general purpose, knee-type machines . . . faster, easier control for greater production with less operator fatigue.

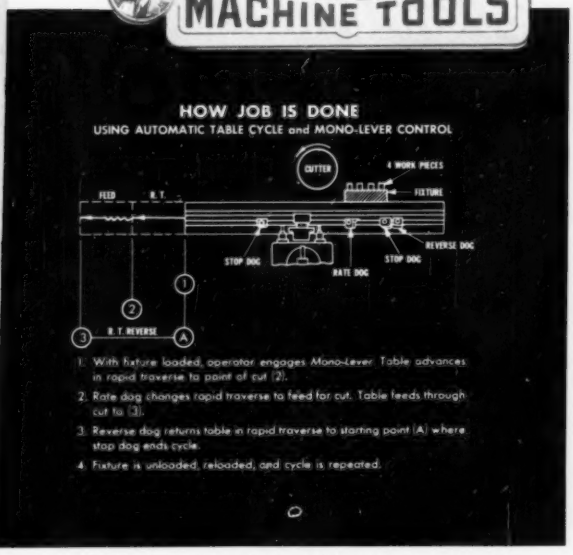
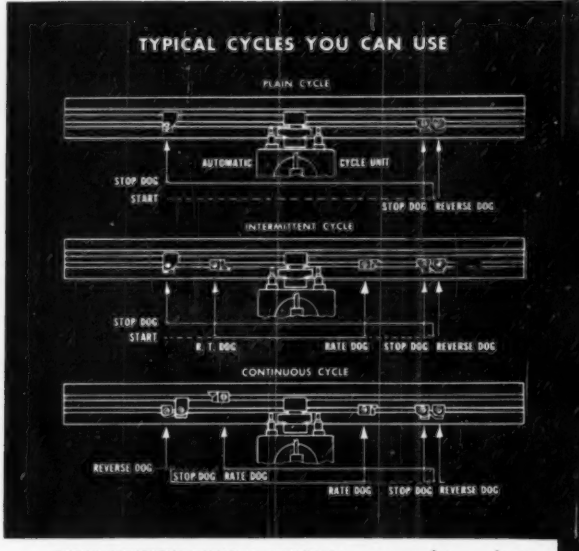
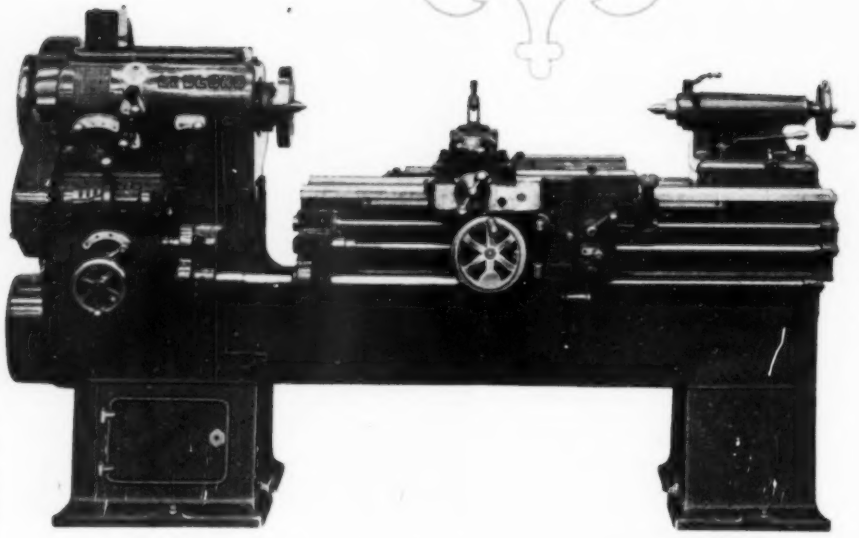

HOW JOB IS DONE
USING AUTOMATIC TABLE CYCLE and MONO-LEVER CONTROL
CUTTER
4 WORK PIECES
FEED
R.T.
FIXTURE
STOP DOG
RATE DOG
STOP DOG
REVERSE DOG
R.T. REVERSE
1. With fixture loaded, operator engages Mono-Lever. Table advances in rapid traverse to point of cut (2).
2. Rate dog changes rapid traverse to feed for cut. Table feeds through cut to (3).
3. Reverse dog returns table in rapid traverse to starting point (A) where stop dog ends cycle.
4. Fixture is unloaded, reloaded, and cycle is repeated.

DIAGRAM above shows how machine with new *Mono-Lever* control mills workpieces without operator's constant attention. Note how quickly control engages feed from rapid traverse — eliminating hand "inching" to cut — leaving operator free to inspect and burr workpieces.



THREE DIFFERENT TYPICAL CYCLES to accommodate various job setups. Using the completely automatic cycle feature effects savings of up to 31% for lots of 10 or more pieces. Cycle can be set for loading and unloading time — and can be reversed in feed or rapid traverse.



LOW PRICED SLIDING BED GAP LATHE
offered for first time by LeBLOND

The new LeBlond 17"/28" sliding bed gap is the first low priced lathe of its type ever offered the metal working industry. The base size machine has a 20" wide gap which increases swing capacity from 17¾" to 30" and center distance from 38" to 58". It is built around the LeBlond Regal, famous the world over for low cost metal turning.

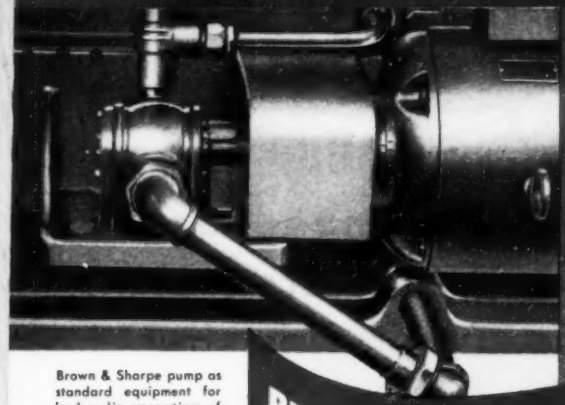
Arranged for 2- or 3-hp 1800 rpm or 3/1½-hp 1800/900 motor, the new 17"/28" Regal will deliver full power for medium duty turning. With single speed motor 8 geared spindle speeds are available ranging from 20 to 425 rpm; with 2-speed motor 16 speeds ranging from 10 to 425 rpm. When furnished with the Gerbing drive, it will deliver a variable number of speeds ranging from 12 to 690 rpm.

Shops requiring the flexible capacity of a sliding bed gap lathe at a low initial investment will welcome the new 17"/28" Regal. For complete information, send today for bulletin RSBG 1.

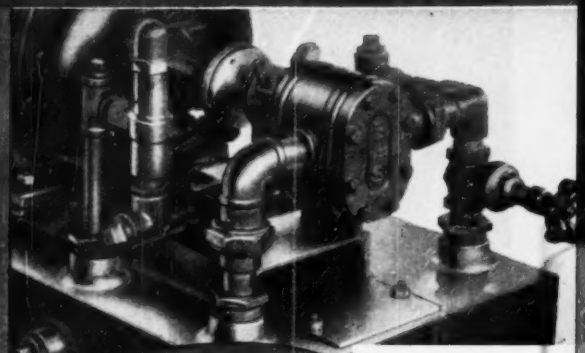
THE R. K. LeBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO
LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES.
SALES OFFICES: New York, Chicago, Philadelphia, Detroit.

LeBLOND

RIGHT in their element . . .
ON HYDRAULIC SYSTEMS

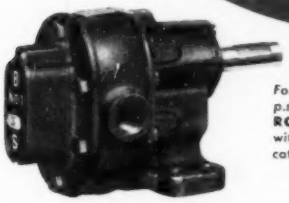


Brown & Sharpe pump as standard equipment for hydraulic operation of machine tool.



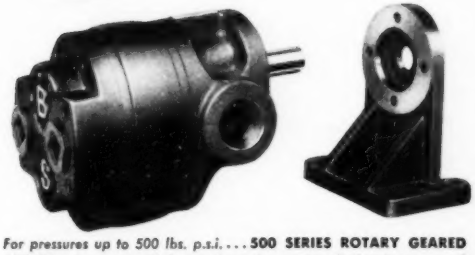
Compact installation of Brown & Sharpe pump for hydraulic operation of stoker unit.

BROWN & SHARPE Rotary Geared PUMPS



For pressures up to 100 lbs. p.s.i. . . . **NOS. 1S, 2S and 3S ROTARY GEARED PUMPS** with helical gears. Self-lubricating.

For pressures up to 200 lbs. p.s.i . . . **NOS. 53 and 55 ROTARY GEARED PUMPS** with roller bearings and helical gears.



For pressures up to 500 lbs. p.s.i. . . . **500 SERIES ROTARY GEARED PUMPS**—six sizes—with Herringbone Gears. Needle bearings, ground joints, alloy steel shafts, reversible back drain for reversing rotation. All moving parts balanced hydraulically . . . the 4 larger sizes, are balanced mechanically also. Foot-type mounting brackets available to meet practically any mounting condition.

Because these rotary geared pumps are specifically designed for hydraulic service, their features show up to advantage in daily operation. They are simple, compact, dependable and quiet. Their gears are made with extreme accuracy . . . to standards that characterize Brown & Sharpe machines and equipment. All have a mechanical seal designed to prevent leakage and eliminate gland adjustments. Everything about these pumps . . . design, materials, and manufacturing . . . is the result of long experience in meeting pump requirements for machine tools and other machine equipment.

Thousands of these pumps in daily service are giving performance that proves they are RIGHT in their element on hydraulic systems. Get complete information and specifications. Write for Pump Bulletin. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

GEARED • VANE • CENTRIFUGAL • MOTOR DRIVEN

We urge buying through the Distributor

BROWN & SHARPE PUMPS B·S

Parts That Are Difficult

For SUNNEN HONING

—Best for sizing internal diameters

√ No jigs or fixtures needed
√ No costly tool obsolescence
√ No loading or unloading time

You save money all around!

Sunnen Honing simplifies and speeds production of parts with irregular shapes. It operates on the principle of "floating" the work on a rotating mandrel and stone. No jigs, fixtures or other holding devices are needed. As fast as you finish one part, slip another on the mandrel — thus, you eliminate loading time, too.

FOR HIGH-SPEED, ACCURATE WORK

These versatile Honing Machines provide the right combinations of speed and accuracy for your internal finishing jobs. You eliminate distortion caused by chucking . . . remove burrs and flash in a matter of seconds . . . correct taper, warpage and bell-mouth quickly and easily. And Sunnen Honing gives you fast, controlled stock removal — up to .020" per minute.

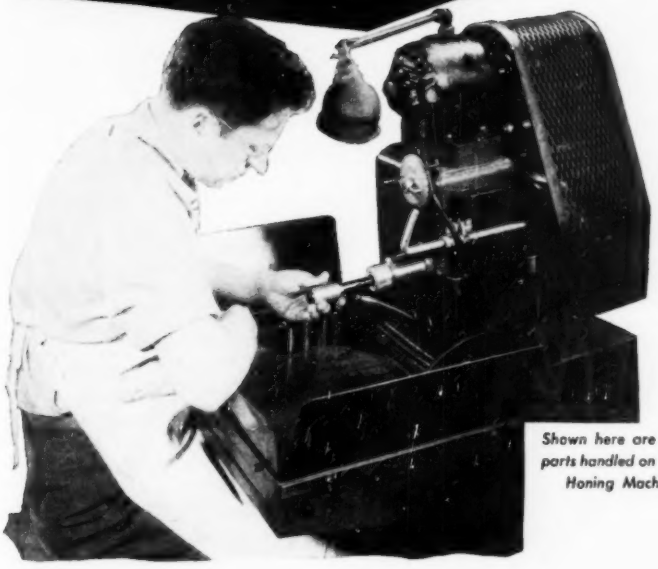
If extreme precision is required, Sunnen Honing can produce amazing accuracy. Holes are straight and round — guaranteed within .0001" — and with any microinch finish desired.

Let us send you the facts on time-saving, cost-cutting Sunnen Honing. Free Booklet MB-11 describes the operation, gives specifications. Write for it today.

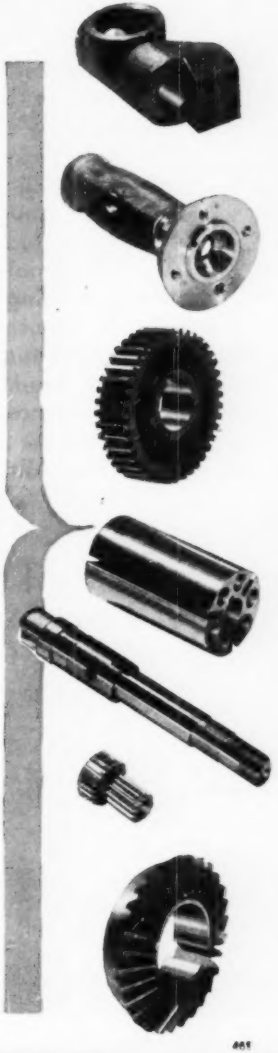
SUNNEN HONING
Assures Low Cost

to Chuck Are No Problem

ANOTHER TYPICAL SUNNEN CASE HISTORY



Shown here are typical parts handled on Sunnen Honing Machines



"Sunnen Honing Gives Us Accurate Parts and Good Finish – Faster Than Any Other Method."

... Buckeye Tools Corp., Dayton, Ohio

"Steel, cast iron, aluminum, brass and bronze are all honed easily on our Sunnen machines. We get real quality work at reasonable cost — and we are always certain that our parts have the kind of finish that makes them last longer."

SUNNEN PRODUCTS COMPANY
7941 Manchester Ave., St. Louis 17, Missouri

Production of Accurate Holes

THE GRAY WAY
to increase production

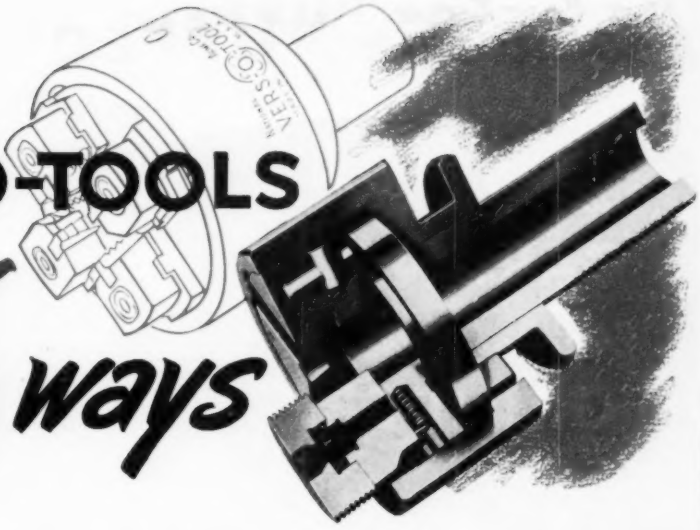
Multi-cutter carbide milling on a production basis requires great power and exceptional rigidity. The new Gray 66″ x 60″ x 20′ unit head Milling Machine amply fills these requirements at The S & S Corrugated Paper Machinery Co., Inc., Brooklyn, N. Y. The time for machining the 3,300 lb. S & S Cut Off Housing illustrated has been substantially reduced and quality of work improved. Power, Convenience, and Accuracy characterize the new Gray Planer Type Milling Machines.

The G.A. **GRAY** *Company*

planers • milling planers
planer type milling machines
horizontal boring machines

CINCINNATI 7, OHIO, U. S. A.
SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. • SOLD IN LATIN AMERICA BY MACHINE AFFILIATES

VERS-O-TOOLS save 6 ways



1 2 3 4 5 6

SAVE ON PARTS—The Vers-O-Tool is the simplest die head made—only 3 main parts: body, hood and adjusting plate. Body is integral with shank; prevents wear looseness, maintains alignment. Fewer small parts to wear or replace.

SAVE ON SPACE AND WEIGHT—The Vers-O-Tool has the smallest O.D. in relation to cutting range of any comparable die head. Both revolving and stationary styles are ideally adapted for use where space and weight are a problem.

SAVE ON PRODUCTION REJECTS—The Vers-O-Tool is precision built throughout. All parts are hardened and ground, to close limits. Sustained accuracy on long runs is characteristic—as is long life.

SAVE ON PRODUCTION TIME—The Vers-O-Tool operates simply, dependably at all times. Opening action is quick, yet smooth—no triggers or other auxiliary gadgets to get out of adjustment and slow up the smooth flow of production.

SAVE ON REGRINDS—The Vers-O-Tool vernier adjustment for locating chasers through a serrated bushing provides for grinds as small as .008". Chaser life is longer, too, whether you use the circular type, for long runs, or the adjustable blade type, for shorter runs.

SAVE ON SET-UP TIME—The Vers-O-Tool design is outstanding for quick diametric adjustment. Two screws move all chasers simultaneously; set-up is completed in a mere matter of seconds.

Simplicity of construction saves time and money on every Vers-O-Tool application. Standardization of interchangeable chasers, size for size, permits the use of just one head for all threading and hollow milling in a given diameter range. For long run work you can use circular chasers, regrindable through 270°—for shorter runs, the new, economical adjustable blade chasers, which always present a perfect thread form, up to correct cutting position, after each regrind.

Complete information on the Namco Vers-O-Tool die head—for use with circular chasers and hollow mill cutters, or adjustable blade chasers and hollow mill cutters is contained in Catalog D-48. Ask for your copy.

24-hour deliveries on standard stockable NF and NC chasers and blocks.

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley 4-6 and 8 Spindle Bar and Chucking Automatics • Single Spindle Automatics • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

Production "UPPED" 11 *Times*

with this 36"
GARDNER
Vertical Surface
GRINDER

THIS special GARDNER Vertical Surface GRINDER has boosted production from 105 to 1200 snag-ground motor end housings per hour, as compared to former hand-snagging. It carries a 36" grinding wheel mounted on a vertical column, and is powered by a 25 H.P. motor.

A rotary work-table carries a series of fixtures, having adapters and adjustments, that permit grinding several types of housings, with a minimum of change-over.

This is but one example of how GARDNER-GRINDING will offset rising labor costs and reduce per-unit costs for you.

WORK DATA

Part *Motor End Housings*
Material *Cast Iron*
Operation *Snag-Grind Flat Surface*
Tolerances *Clean Up*
Production *20 Housings Per Minute*
Feed *Hand Load and Unload*
Machine *No. 162-36" Gardner Grinder*

Write for Latest Bulletin on GARDNER-GRINDING!

GARDNER-GRIND YOUR *Flat* SURFACES

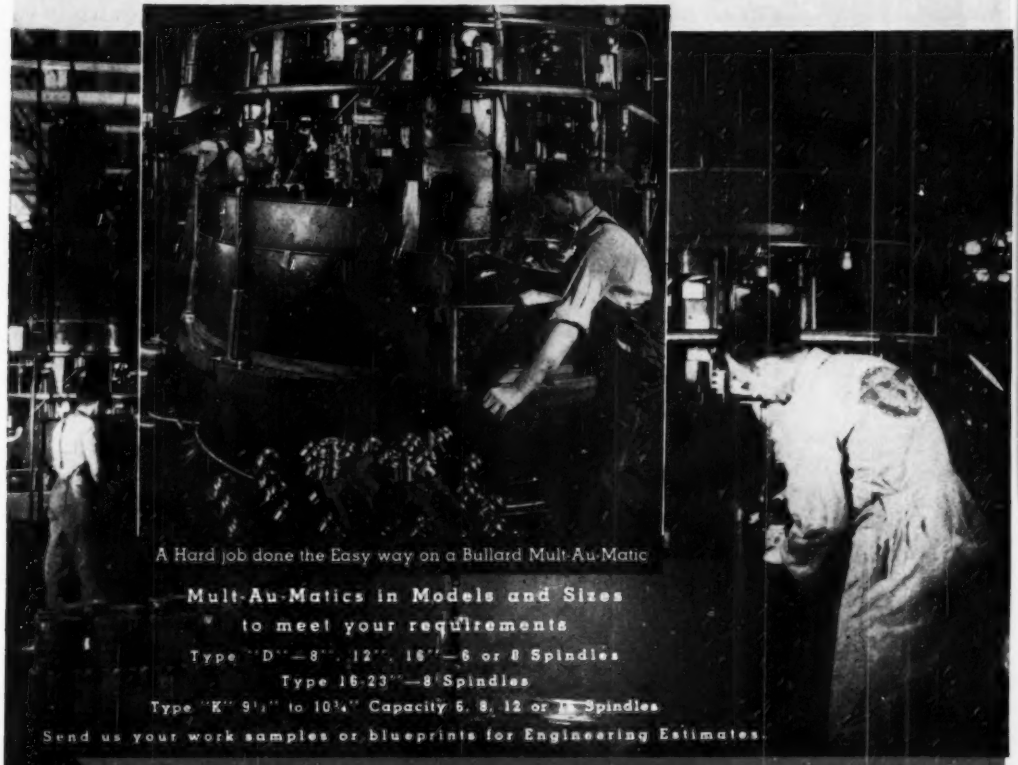
GARDNER MACHINE COMPANY
410 East Gardner Street • • • • Beloit, Wisconsin, U.S.A.

Profitable Productive Ability with MEN and MACHINES...

A well known axiom "The whole is greater than any of its parts" leads us to consider—Men and Machines. Mult-Au-Matics are designed and built with a thought to the human operating element. Operators on every hand acclaim this viewpoint and produce accordingly. Therefore, with men and Mult-Au-Matics, Production Volume is only limited by the Ability of the Mult-Au Matics themselves.

This Ability or Productive Capacity is definitely stated in Bullard Engineering Estimates on your work. We suggest that you take advantage of our Engineering Service with a view to making comparative studies. Reflect on your comparisons, and at the same time Reflect on—Men and Mult-Au-Matics—The Profitable Combination.

BULLARD



A Hard job done the Easy way on a Bullard Mult-Au-Matic

Mult-Au-Matics in Models and Sizes to meet your requirements

Type "D"—8", 12", 16"—6 or 8 Spindles

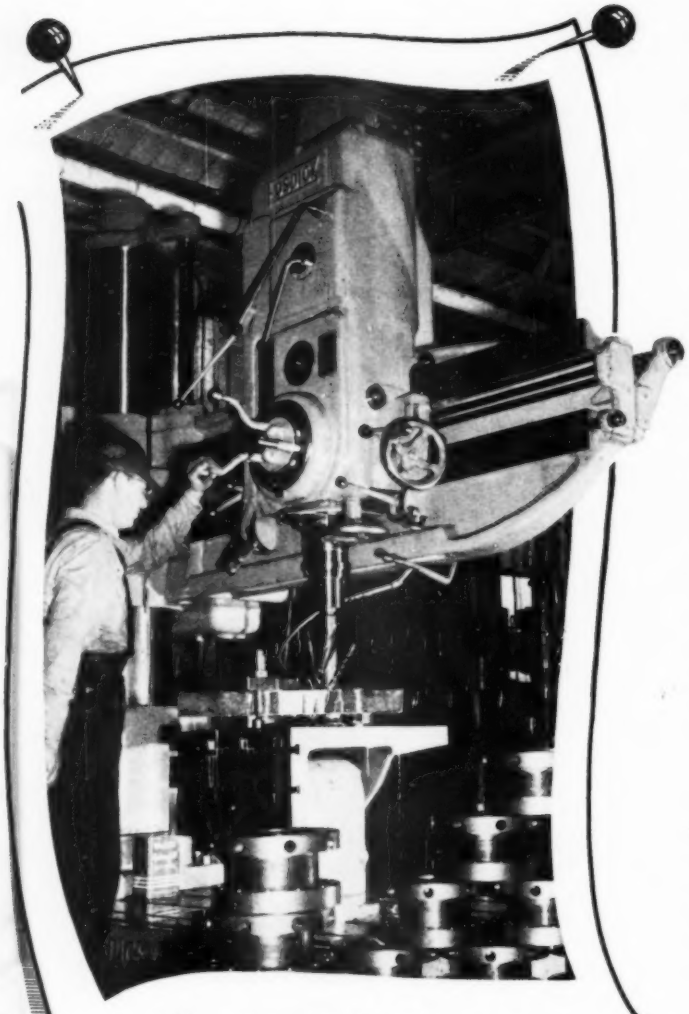
Type 16-23"—8 Spindles

Type "K" 9¼" to 10¾" Capacity 6, 8, 12 or 18 Spindles

Send us your work samples or blueprints for Engineering Estimates.

THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT



This picture tells its own story-

FOSDICK
HYDRAULIC
RADIAL•••

● Here is a typical shop scene of a FOSDICK Hydraulic RADIAL Drilling a hole in a steel piece.

On this machine the clamping of both head and column have been interlocked with the engaging of the feed mechanism. This hydraulic device operates from the conveniently located spindle feed clutch lever on the head. Saves operator time on set-up and locks head and arm instantly with throwing-in of feed clutch lever.

Another innovation is the fluorescent light located in a recess in the bottom of the arm which insures an even distribution of light over the work and at the point of contact of the drill, tap or reamer.

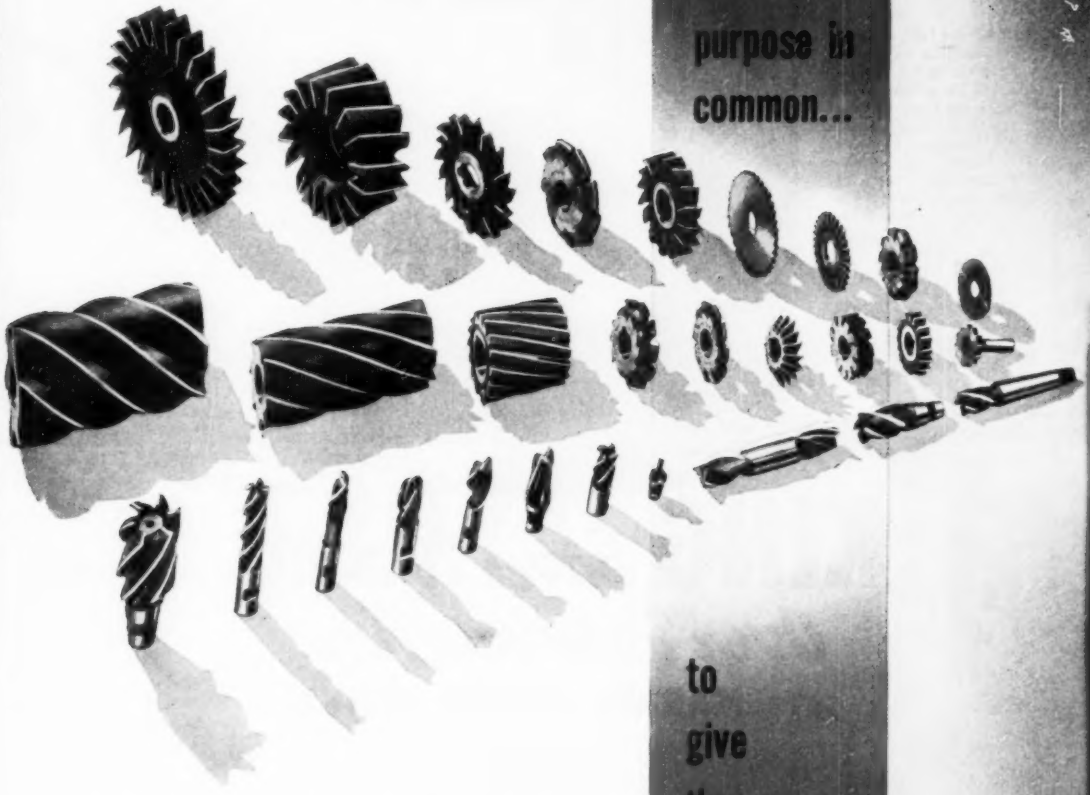
Another advantage is the tool ejector which automatically disengages the tool by moving spindle to extreme "up" position. Not only is this quicker than hunting for a hammer and drift to knock tool out but eliminates damage to tool shanks.

These are but a few of the many advantages offered in the new Fosdick Hydraulic Radial. *For complete details write for the Fosdick Hydraulic Radial Bulletin RDA.*

FOSDICK MACHINE TOOL *Company*
CINCINNATI 23, OHIO

many styles . . . many sizes

with one purpose in common . . .



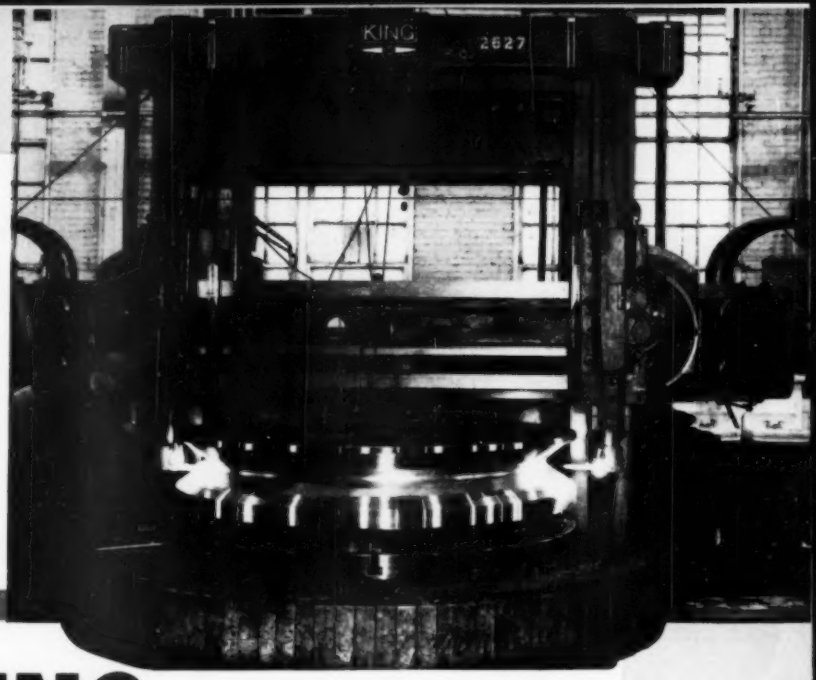
to give the lowest REAL cutter cost

Here's a broad line of cutters that meets every requirement for lowest *real* cutter cost. Each item in the line has design and construction details specifically developed to give fast cutting rates, close accuracy in the duplication of parts and long service life between sharpenings.

Check all the advantages of Brown & Sharpe Cutters. A broad range of cutter styles and sizes is available for efficient milling on a wide variety of work and materials. Write for complete details. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

We urge buying through the Distributor

BROWN & SHARPE CUTTERS B·S



New Series 100" KING Vertical Boring & Turning Machine turning the groove of a 91" diam. cable sheave for a large Marion Power Shovel. The cable groove is 4½" deep and 6½" wide at the top. Width of rim is 9". The sheave has a 14" long hub having a 14½" diam. bore which is machined to a tolerance of +.000" —.001".

KING *Saves 20 to 30% Over Previous Time*

SAYS MARION POWER SHOVEL

Officials of the Marion Power Shovel Company, Marion, Ohio, report the following facts about their New Series 100" KING:

- ✓ "Accuracy obtainable on this machine makes it possible to machine bores to close tolerances as required for roller and ball bearings used in sheaves, gears, and gear cases.
- ✓ "High speed and rigidity make it ideal for use with tungsten carbide.
- ✓ "20% to 30% time is saved by the use of the King Mill as against previous methods."

This prominent manufacturer of heavy excavating machinery schedules a wide variety of work on this New Series KING. Various types of weldments and castings are machined, including spur and bevel gears and gear cases; yoke frames; sheaves up to 100" o.d. with grooves for 2" to 3" cable; and cable drums, 88" o.d. by 64" high, weighing as much as 16,000 pounds. This example provides further proof of the power, rigidity, range and flexibility of operation built into KING Vertical Boring & Turning Machines.

If you want to cut costs and improve quality on your boring, turning and facing work, it will pay you to investigate the New Series KING. Consult a King engineer — there is no obligation.

10 SIZES *One head on rail, 30" and 36". One or two heads on rail, 42", 52", 62", 72", 84", 100", 120", and 144". All available with or without side head and in a variety of head combinations.*

American Steel Foundries

KING MACHINE TOOL DIVISION

CINCINNATI 29, OHIO

Builders of King Vertical Boring & Turning Machines and Sebastian Lathes

CLEEREMAN

UNEXCELLED PRECISION

PRECISION with STAMINA and *Operating Facility*

JIG BORERS

Small Lot Production

WITHOUT LAYOUT TIME, JIGS OR FIXTURES

Tool Room Production

OF ACCURATE TOOLS, DIES AND JIGS

UNEXCELLED PRECISION is built into every Cleereman Jig Borer by skilled craftsmen who take a personal pride in the quality of their work. And behind their exceptional workmanship is excellence of design, exacting specifications and a manufacturing technique and procedure which assures a precise machine tool.

STAMINA maintains this in-built precision through a long life of extremely accurate work. Specially processed and tested materials, properly matched, combat wear of ways and secure stability.

OPERATING FACILITY has long been accepted as characteristic of all Cleereman machine tools. Convenient, time saving grouping of controls aids appreciably in producing more work. Prepositioning power rapid traverse or electronic traverse and milling control accessories speed operation.

WIRE OR WRITE for catalog with complete specifications.

Address —

BRYANT Machinery & Engineering Company

General Office
400 West Madison Street, Chicago 6
Representatives in Principal Cities

Affiliated with—

CLEEREMAN MACHINE TOOL CO. Green Bay, Wis.

BUILDERS OF PRECISION JIG BORERS AND DRILLING MACHINES

A note on Abrasives

The Advantages you get from "Advanced" Technical Research

During the war, a shortage of bonding material, used in making grinding wheels, developed. This situation could have presented a serious problem... except for the fact that it had been anticipated. A substitute had been largely developed in advance by our researchers and now was rushed into service. Not only did it fill the immediate need...it proved superior and continues in current use.

In developing and producing better abrasives, science and production agreed the answer might be found in a study of the development of silicon carbide and aluminum oxide crystals in a furnace where operating temperatures exceeded 2000°C. Not only did researchers of The Carborundum Company develop a high-temperature microscope for this work—they hooked it up with a camera to photograph the reaction in color.

These two, out of a hundred and one research activities underway at The Carborundum Company, help explain why the right abrasive products by CARBORUNDUM are ready whenever new high-temperature alloys or other new materials are developed, or new industrial techniques put into operation.

From these laboratories have come wheels that precision grind thousands of parts with unvarying accuracy...belts and discs that cut faster and cooler, grains that generate high finishes in a hurry. It is an extra assurance of continual improvement in grinding, sanding and finishing with abrasives by CARBORUNDUM. The Carborundum Company, Niagara Falls, New York.

The only complete line of Abrasive Tools is

CARBORUNDUM

TRADE MARK

"Carborundum" and "Aloxite" are registered trademarks which indicate manufacture by The Carborundum Company

Engineering News
ON ABRASIVE PRODUCTS

ALOXITE TPT POLISHING GRAIN

TPT is a new aluminum oxide abrasive grain specially developed for polishing operations which require removal of comparatively large amounts of metal. Especially suited for severe polishing operations, it cuts fast and is highly efficient. In actual comparative tests, this tough, sharp, long lasting abrasive gives as much as 100% greater production per wheel set up. It is also ideally suited to the entire field of grain polishing applications and can be applied successfully and economically within its available grit range, sizes 16 to 60.

TPT POLISHING GRAIN OFFERS THESE IMPROVED QUALITIES:

TOUGHNESS—Special processing assures resistance to fracture, on severe operations. Polishing wheels headed with TPT grain last longer and require heading less frequently.

UNIFORMITY—All working grain, solid, well-shaped, sharp and angular—free from useless flats, splinters and weak particles.

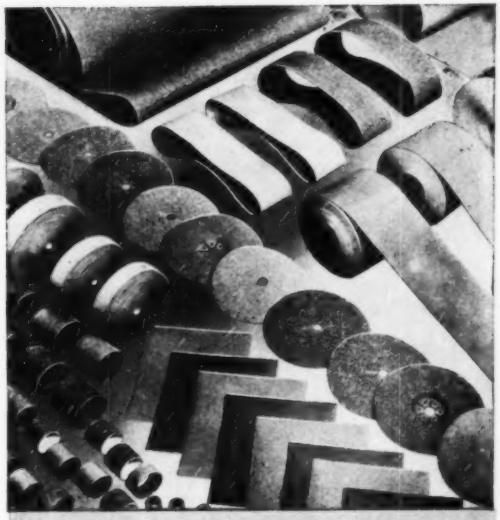
FASTER CUTTING—Sharp particles retain sharpness and angularity for longer periods...provide higher production rates and more economical operation.

IMPROVED EFFICIENCY—Each set-up lasts longer, produces more pieces per hour, and cuts abrasive and polishing costs. Longer lasting polishing wheel set-ups reduce number of expensive re-headings.

THE VONNEGUT BRUSH-BACKED SANDER HEAD

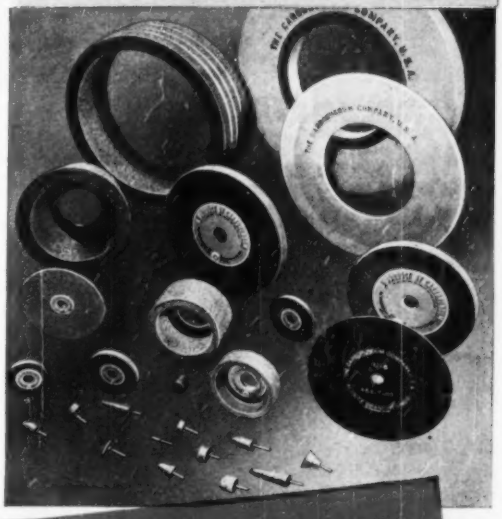
Designed for use on irregular surfaces, this sander head finishes, in seconds, jobs that usually take minutes longer by costly hand sanding or other less efficient methods. Shredded abrasive tips contact every groove and depression of contours, curves, carved and moulded surfaces... produce an excellent uniform finish which may be buffed easily as desired. It is particularly effective in blending surface irregularities and eliminating scratches, mold flash and burrs of moderate severity.

While the use of the Vonnegut sander head is new to the metal working field, it is not new in principle. For many years, it has been used successfully by the wood-working trade. Practical production experience in metal operations shows equally successful and economical results. The heads are cleaner in service, cooler-cutting, operate with less pressure and enable workers to produce better finishes with less effort. Their design and construction is simple. Loading, adjustment and operation are easy.



COATED PRODUCTS SHEETS • ROLLS • BELTS • DISCS SPECIAL SHAPES

BONDED PRODUCTS ABRASIVE WHEELS • STICKS, STONES AND RUBS • SPECIALTIES • SUPERFINISHING STONES • SPECIAL FORMS • ABRASIVE GRAINS AND FINISHING COMPOUNDS

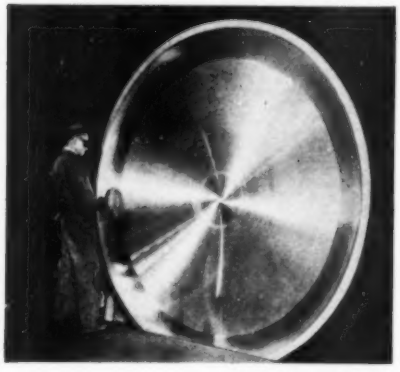


FOR EVERY ABRASIVE APPLICATION
...CALL IN
CARBORUNDUM
TRADE MARK

STAINLESS lets you spin 'em BIG!

This large stainless steel tank end being spun to the desired radius is made up of standard width sheets of "18-8" welded together and the welds ground smooth.

(Below) Another large stainless steel tank end, already spun to shape, shown here being polished.



HERE is austenitic chromium-nickel stainless steel, Type 305, being spun into a huge tank end. Another, of Type 302 . . . spun to shape and receiving a polish . . . is pictured at the left.

These large units attest to the adaptability of austenitic stainless steels to this method of fabrication.

Types 302, 304, and especially Type 305, lend themselves well to modern spinning operations according to the producers of these tank ends, Milwaukee Metal Spinning Company (Spincraft) of Milwaukee 8, Wisc. On a production basis, this company spins heads and ends for milk storage tanks ranging from 36 to 102 inches in diameter.

This is only one of many applications in which advantage may be taken of the various useful properties of chromium-nickel stainless steels.

You can trim bulk and deadweight by specifying correct types of stainless. They are strong yet tough, moreover, they resist wear and abrasion.

You get long service life because these alloys are resistant to attack by nearly all oxidizing acid conditions. They assure long, trouble-free performance of equipment, and hygienic cleanliness as well as economy in food, drug, chemical and other process industries.

Leading steel companies produce austenitic chromium-nickel stainless steels in all commercial forms. A list of sources of supply will be furnished on request.

EMBLEM OF INCO SERVICE

Over the years, International Nickel has accumulated a fund of useful information on the properties, treatment, fabrication and performance of engineering alloy steels, stainless steels, cast irons, brasses, bronzes, nickel silver, cupro-nickel and other alloys containing nickel. Write for "List A" of available publications.

THE INTERNATIONAL NICKEL COMPANY, INC.

67 WALL STREET
NEW YORK 5, N. Y.

BULLARD *Universal*

BORING MACHINES INSURE PRODUCTIVE CAPACITY . . . with *Maintained Accuracy*

Made in 3-inch, 4-inch and 5-inch spindle sizes

Accuracy of your boring, drilling and milling operations is assured with Bullard-Universal Boring Machines.

These well designed and rigidly built machines have a well known Productive Capacity with maintained Accuracy.

1. **Stability**
2. **Productivity**
3. **Maintained Accuracy**
4. **Centralized right hand control**
5. **One shot lubrication for head, saddle and table assembly**
6. **Anti-friction bearings**
7. **3-inch, 4-inch and 5-inch Spindles with selection of Bed lengths, Column heights and Table sizes**

GOOD REASONS WHY

Convenient right hand centralized controls speed up operation.

Rapid Traverse to all units in all directions eliminates much lost time between operations.

Ease of operation and control minimizes operator fatigue.

Hydrodynamic coupling provides unsurpassed smoothness of Power flow for all operations. (Greater tool efficiency).

AND FOR THE MAINTAINED ACCURACY

1. Heavy well ribbed box type Bed construction absorbs vibration and torsional strains.
2. Sturdy, heavily ribbed Posts assure maximum rigidity.
3. Extra heavy gibs with gib within gib construction having adjustment of the wear shoe.
4. Table and Saddle unit construction offers continued precision alignment.
5. Precision types of Anti-friction bearings minimize horsepower requirements and assure sustained accuracy.

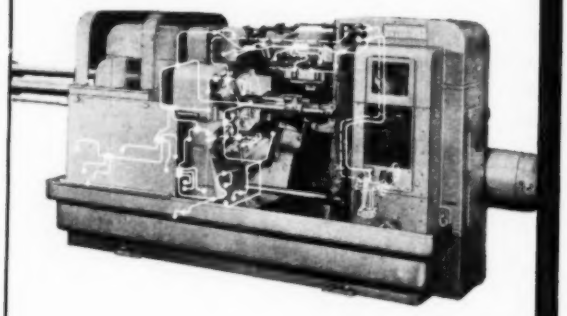
THE BULLARD COMPANY

BULLARD

BRIDGEPORT 2, CONN.

Your machines run smoother, longer...

THE WARNER & SWASEY COMPANY
Five Spindle Automatic Bar Machine



...on bearings oiled by an automatic system of "metered" lubrication

Your machines run smoother, longer and continuously on Bijur-oiled bearings.

Smoother because the correct oil film is constantly maintained by meter-units at the bearings. *Longer* because overall bearing wear is considerably reduced by positive control of oil flow. *Continuously* because a Bijur-equipped machine oils itself while running, eliminating down-time for lubrication.

These factors enable the user to boost production output, cut maintenance costs, and also lengthen the effective life of the machine.

Increased Production Output. A Bijur-lubricated machine oils itself while running, doing away with wasteful down-time for lubrication. Daily maintenance time is thus converted into more time for production.

Decreased Maintenance Costs. A Bijur-lubricated machine assures positive control of oil flow, considerably reducing bearing wear. Longer effective bearing life results in less down-time for repairs and maintenance.

If lubrication is your problem, why not call on the Bijur engineer, or write for "The Travels of Modern Lubrication." This quarterly bulletin shows how leading manufacturers protect performance and maintain production by using Bijur-lubricated machines.

BIJUR

LUBRICATING CORPORATION

LONG ISLAND CITY 1 NEW YORK

884

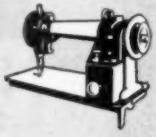
Leading manufacturers who standardize on the Bijur system.

SHEET METAL MACHINERY
Verson "Press Brake"

PACKAGING MACHINERY
Pneumatic Scale "Rotary Top Closing Machine"

FOOD MACHINERY
Baker Perkins "Dough Divider"

PRINTING PRESS
ATF "Chief Offset Press"



TEXTILE MACHINERY
Willcox & Gibbs "Lockstitch Machine"

Like these manufacturers, you too can "be sure with Bijur."

ARMSTRONG

TOOL HOLDERS... for every operation!

There are ARMSTRONG TOOL HOLDERS in sizes and types for every operation on lathes, planers, slotters and shapers —for the heaviest cuts; for the most delicate cuts.

With Standard shaped cutters, bits and blades of ARMSTRONG HIGH SPEED, ARMALOY (Cast Alloy) and ARMIDE (Carbide-Tipped) they provide a system of tooling that assures maximum production per machine hour, lower tool costs, and higher machining profits.

These permanent multi-purpose tools can be picked up as needed from your industrial distributor. Use them wherever possible to increase number of pieces per hour, to lower cost per pieces.

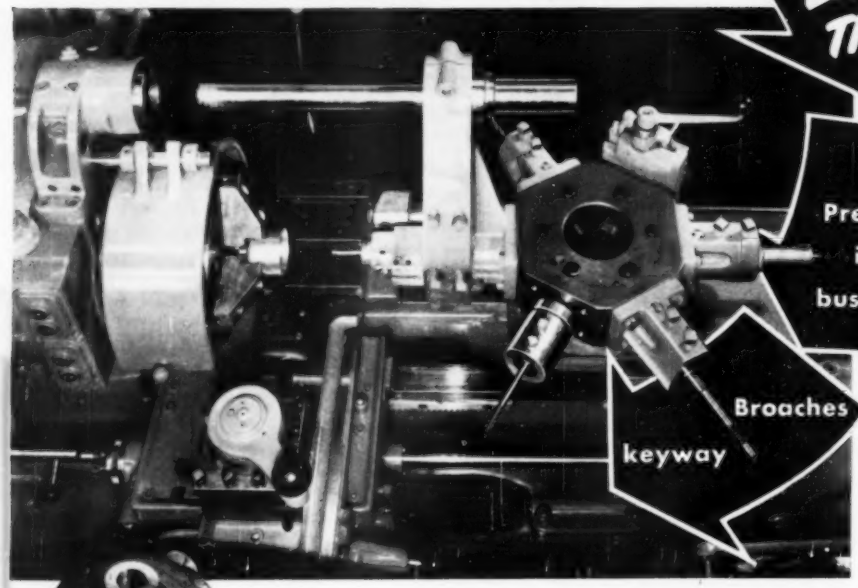
Write for Our New S-48 Catalog.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5215 W. Armstrong Ave. Chicago 30, Ill.

Turret Lathe Ideas—



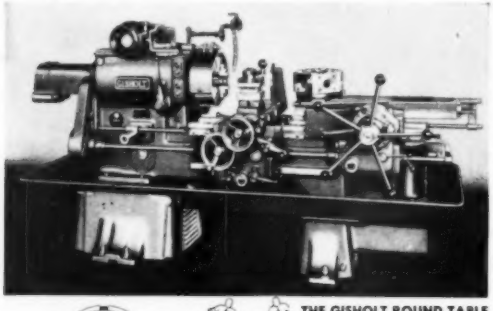
Save you time and money... INCREASE PRODUCTION!

Darned clever, these production men!

Note the use of this Gisholt No. 3 Ram Type Turret Lathe. In addition to handling all the typical drilling, boring, facing and reaming operations on the inside of a small motor housing, this turret lathe is used to:

Broach the keyway
Press in a bushing
Finish machine in place

Gisholt No. 3 Universal Ram Type Turret Lathe



The entire operation on these parts takes only 1.37 minutes. Figure the time and cost saved in not having to transfer parts to other machines—or other departments—for these operations.

Don't overlook the many ways you can get greater production from your turret lathes. Gisholt engineers have all kinds of money-saving ideas to help you with your problems. Ask one to call. Or write us.

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.*

GISHOLT MACHINE COMPANY
Madison 10, Wis.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

no other milling cutter will outperform a UNION

contact your local distributor

His name is listed in Union's THOMAS' REGISTER insert under the heading "Drills, Twist".

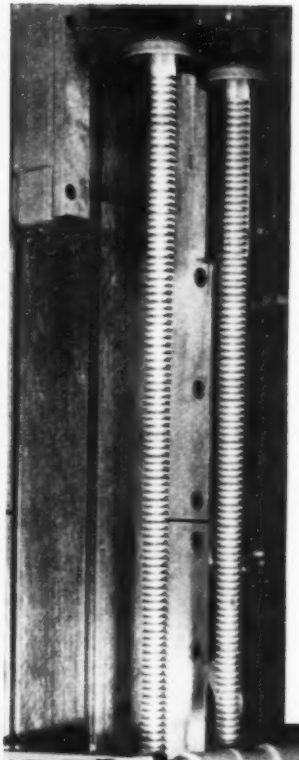
UNION TWIST DRILL COMPANY, ATHOL, MASSACHUSETTS

MILLING CUTTERS • GEAR CUTTERS • TWIST DRILLS • HOBS • REAMERS • CARBIDE TOOLS

We own and operate S. W. CARD MANUFACTURING CO. Division, Mansfield, Mass., Taps, Dies, Screw Plates.

BUTTERFIELD DIVISION, Derby Line, Vt., Taps, Dies, Screw Plates, Reamers.

BUTTERFIELD DIVISION, Rock Island, Que., Milling Cutters, Twist Drills, Hobs, Reamers, Taps, Dies, Screw Plates.



THE *American* WAY...

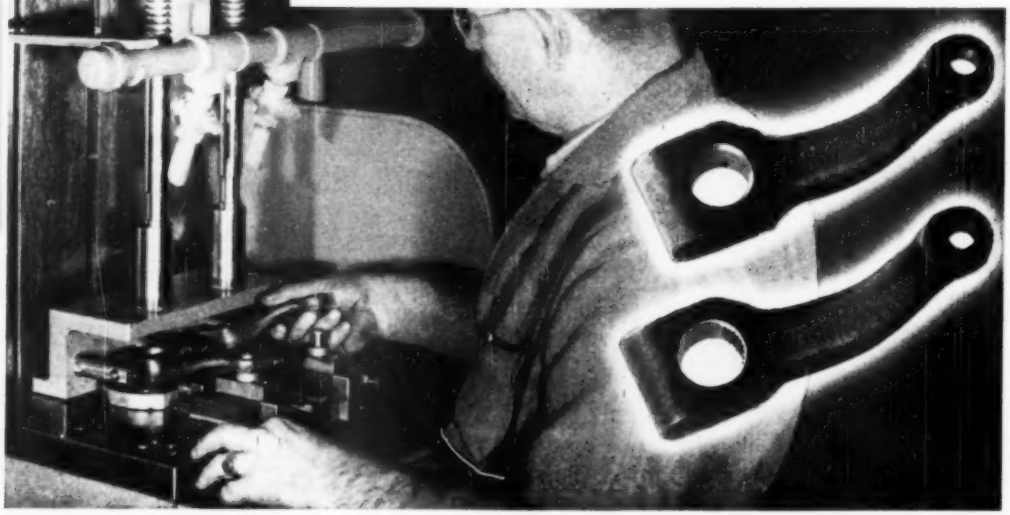
TO PUT "TEETH" IN STEERING ARMS

FASTER . . . AT LOWER COST

Two station fixture on a standard American broaching machine enables this manufacturer to broach 10 serrations in a segment of the steering arm hole and finish broach the hole in one pass. Location of the 10 serrations are maintained by index flats on the broach shanks. An economical, high-production rate of over 250 per hour was attained on an American T-10-36 vertical hydraulic broaching machine, with hydraulically operated, manually controlled broach retriever . . . arranged for two station pull-down broaching. The fixture holds one part at each station completing two parts at each stroke of the ram. Two hand manual control assures absolute operator safety.

Versatile Three-way Machines Achieve Overall Economy

Economical, high-production rates are easily attained on American type T, three-way broaching machines. Designed for inexpensive adaptation to push, pull or surface broaching, with single or multiple tooling of the ram, these three-way machines provide for low-cost conversion as production requirements change. American Engineers will be glad to make their recommendations for your broaching production. Write giving hourly requirements and part sample or drawing. Circular 100 gives full information on three-way machines. Address Dept. A.

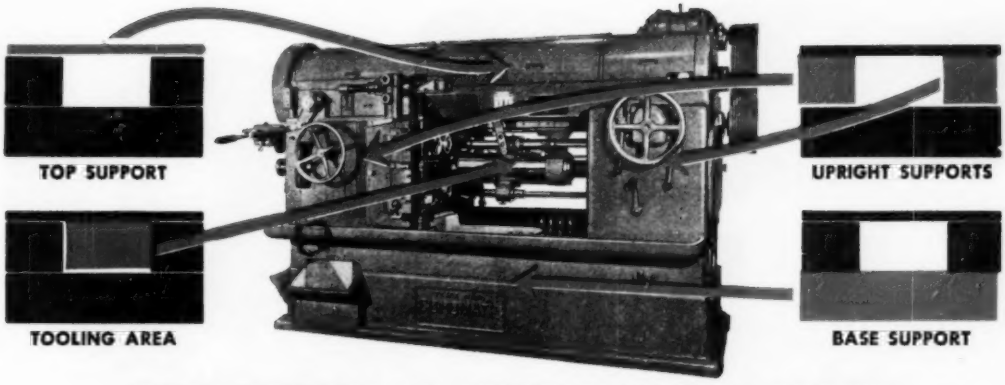


AMERICAN *American* BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

See *American* First—for the Best in Broaching Tools, Broaching Machines, Special Machinery



GOOD DESIGN IS CONSISTENTLY GOOD

All builders of horizontal type multiple spindle automatic bar machines emphasize the importance of substantial frame support to maintain work and tool alignment and insure durable low-cost machine performance. Some have stressed the advantages of box-type frame design and construction. But only Cone has consistently applied these fundamentals by providing a horizontal, rectangular tooling area for a horizontal type machine.

Two frame designs for horizontal type multiple spindle automatics were submitted to automatic users to meet the general requirements here listed. The 100% choice is illustrated above. The Conomatic is its sole representative.

	MACHINE #1*	MACHINE #2	MACHINE #3	MACHINE #4	MACHINE #5
WORK & TOOL CAPACITY	✓				
WORK & TOOL SUPPORT	✓				
WORK & TOOL MAINTENANCE	✓				

*CONOMATIC

Any good investment has certain qualifications that prove it profitable. The wise investor and smart banker have some sort of measuring stick to analyze every investment they make. Why not use a chart to guide your purchases of Automatic Bar Machines? If you are already using a chart, perhaps you would like to compare it with the one that we have prepared. Write to us for a copy or ask your Cone representative.

WORK & TOOL CAPACITY

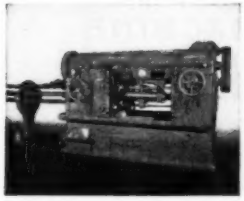
Long, open, roomy Tooling Area and long main end slide for handling longer work and for clearing die heads in threading, etc., to the full collet capacity of the machine; for heavy cross-slide cuts, deep hole drilling, and general all-round work with HSS or Carbide Tools.

WORK & TOOL SUPPORT

Genuine, horizontal, rectangular box-frame free of overhang; heavy-set, rigid upright members for supporting headstock and gear box units between heavy, full-length top and base members, for substantial support of all work and tools close to the work and tool axis, and for the maintenance of accurate alignment of work and tools.

WORK & TOOL MAINTENANCE

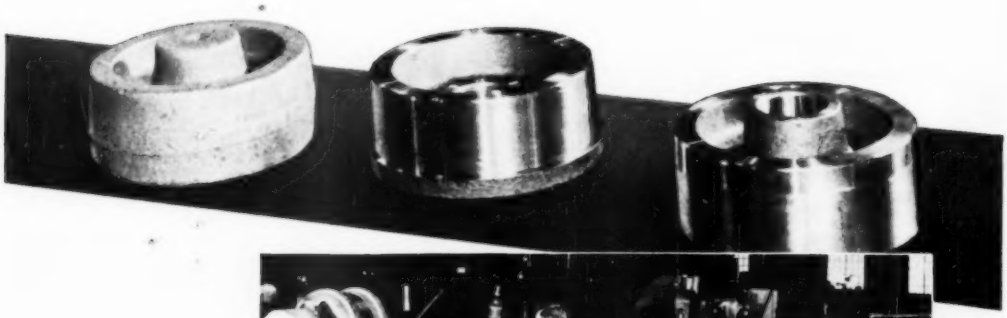
Heavy, strong, well supported, overhang-free, vibration-free, liberal bearing, convenient, adjustable, work holding units and tool slides, with accessible chip-free cams, with adequate capacity in base member for chip disposal and cutting coolant.



A comparison with ALL Automatics will lead you to

Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.



from 41.9 Minutes down to 15 Minutes

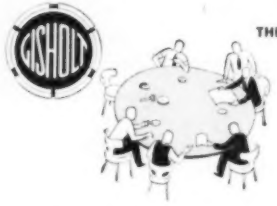
That's Productivity with the GISHOLT FASTERMATIC

The Gisholt Fastermatics are built in three sizes ranging from 21" to 36½" swing over bed.

The cost of machining these gear blanks at the Falk Corp. took a sharp drop when the Fastermatics took over. Time was cut nearly two-thirds. Moreover, human errors were eliminated, thanks to Fastermatic's ability to hold close tolerances.

One operator tends 2 Fastermatics and a honing machine. Simple tooling makes it possible to handle 9 different sizes of gear blanks.

These modern automatic turret lathes enable you to handle a larger number of operations in one chucking—and cut costs to the bone on a wide variety of work. Ask for facts about them.



THE GISHOLT ROUND TABLE
represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

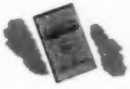
GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

DOGHOUSE!

A designer . . . plagued with production costs of a fluorescent reflector housing . . . solved the double problem of lightness and strength plus fast manufacture. He hadn't considered the economy of finished parts by extrusion . . . had kept magnesium in the doghouse.

But he asked Aluminum Company of America, light metal headquarters, for help. He found that fellow manufacturers every month are using over a million pounds of magnesium. He found that magnesium machines fast, and has a high strength-weight ratio . . . . that common sense shop practice makes handling magnesium no problem.* He got technical advice and books about  designing and fabricating magnesium. Now, instead of fabricating parts like this, he buys immediately available Magnesium Extrusions like this. His production time is slashed. His lighter, stronger reflector housing is outselling competition.

**No change in insurance rates.*

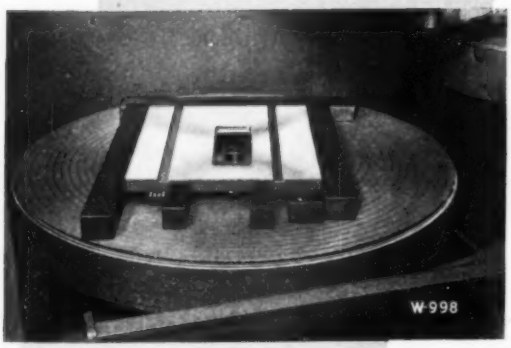
These two, free books on magnesium and our broad technical experience can help your products, too. Write Aluminum Company of America, sales agent for American Magnesium products, 2107G Gulf Building, Pittsburgh 19, Pennsylvania.

MAGNESIUM MAZLO® PRODUCTS

AMERICAN MAGNESIUM CORPORATION

SUBSIDIARY OF ALUMINUM COMPANY OF AMERICA

Put it on the Blanchard



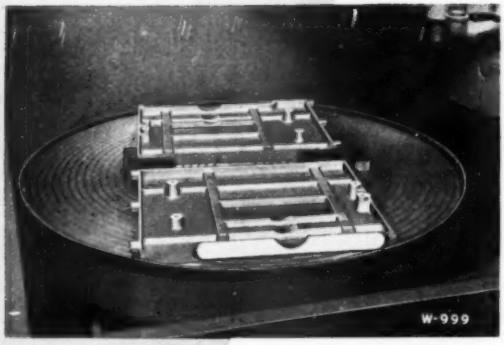
Material: Aluminum Castings

Size: 14¼" x 18"

Held on 36" magnetic chuck on the No. 18 Blanchard Surface Grinder by means of suitable steel or cast iron blocking pieces.

Proper finishing of these aluminum saw table castings required the removal of 1/16" of metal from both sides, to a flatness of .004". The job was put on the Blanchard No. 18 surface grinder in two operation sequences. The broad side is ground first —*to a flatness of .002"*. The flatness and finish of the Blanchard ground surfaces are such that no other finishing or corrective operation is necessary.

They asked for flatness of .004" – They got .002"

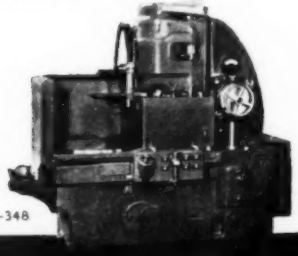


The second operation permits two pieces being laid flat on the chuck, securely held and thus the reverse side is ground to the same flatness limits.

The rate of production is 8½ pieces (17 surfaces) per hour, 8½ of the surfaces being broad and 8½ being narrow or ribbed.

The Blanchard Grinding of these aluminum saw tables was the most economical way to produce smooth flat surfaces and meet customers' limits. In this case Blanchard beat the limits asked for by customer. If the surface must be flat and parallel bring it to the Blanchard for best results.

Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

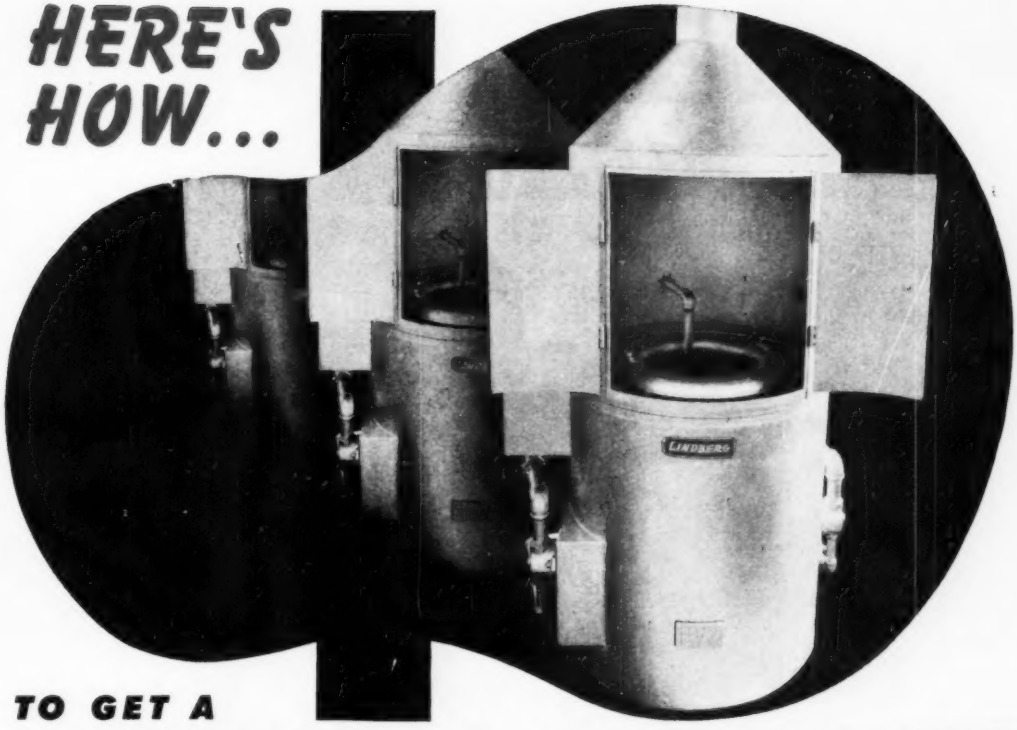


BLANCHARD

The **BLANCHARD** MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

HERE'S HOW...



TO GET A 1 YEAR GUARANTEE ON YOUR CYANIDE POTS

To introduce this unusual furnace we are offering to give you an unqualified guarantee for one year covering "Hi-Life" pots used with cyanide or lead (neutral salts excluded), under automatic temperature control.

Use the new Lindberg "Hi-Life" pots with the new Lindberg "Hi-Life" gas-fired Pot Furnace.

The first Lindberg "Hi-life" Pot Furnace was put in operation two years ago. With 15,000 hours of operation behind it, the original pot is still going strong. Others put into operation later have passed the 8,000 hour mark. We don't ask you to believe in miracles! So we're backing the performance records of these pots with a one year guarantee.

In addition to pot life two to three times the best previous figures, you also get much faster heating and greater efficiency. The new Lindberg "Hi-life" Pot Furnace is lined with Silicon Carbide and Mullite refractories assuring low maintenance in the furnace itself.

The Lindberg Engineering Company considers this new development one of the most significant improvements in furnace equipment in the past decade.

"Hi-Life" Pot Furnaces are available in these 4 standard sizes. (Note small overall dimensions)

POT SIZE		OVERALL SIZE	
24" Dia.	21" Deep	39½" Dia.	35½" Deep
20"	21"	35½"	35½"
16"	18"	31½"	32¾"
12"	18"	27½"	32¾"

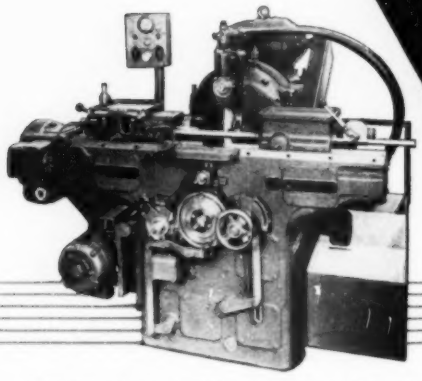
LINDBERG ENGINEERING COMPANY 2445 W. Hubbard Street, Chicago 12, Illinois

LINDBERG **FURNACES**

110% DIVIDEND

THE FIRST YEAR*

The New Process Gear Corp., Syracuse, N. Y., threads 80 of these drive pinions per hour.



The threads are finish ground from the solid after hardening, on a 6 x 15" Jones & Lamson Automatic Thread Grinder.

110% of the funds invested in this machine returned to the purchaser during its first year of operation.

*The piece was completely machined, including the keyway in the thread diameter before hardening. A 6 x 15" J & L Automatic Thread Grinder, using a multi-rib wheel, grinds the thread from the solid, hardened pinion in two revolutions of the work piece, plus the feed-in and lap-over. Scrap was reduced 50%. The savings (based on a daily production of 700 units) in direct labor costs, overhead and gage cost, *paid for machine and equipment in 11 months.*

A survey of your turning, threading and inspection operations by our engineers, might well produce comparable results for you. Write to Dept. 710 G

Thread Grinder Division

JONES & LAMSON MACHINE COMPANY
Springfield, Vermont, U.S.A.

MACHINE TOOL CRAFTSMEN SINCE 1835

What it is—and what it does for you

FAST, uninterrupted production results from Foremost Quality of Standard Shield Brand Tools.

Quality in *design*—they are neither theoretical nor untried, but perfected by 68 years' successful experience in solving tough jobs of drilling, reaming, tapping and cutting for hundreds of makers in the railway, automotive, farm implement, aviation, electrical equipment and home appliance industries.

Quality in *material* — producers of tool steel recognize our specifications as the most rigid of any in the cutting tool industry.

Quality in *workmanship*—skilled tool and die makers, themselves the finest craftsmen of industry—give their critical approval to Standard Shield Brand Workmanship by use.

For you these *Foremost Quality* tools provide uniform performance, uninterrupted production, minimum maintenance, and reduced costs.

Leading Mill Supply Distributors coast to coast can give you prompt delivery on Standard Shield Brand Tools.

STANDARD TOOL CO.

Successor to The Standard Tool Company

CLEVELAND, OHIO

New York • Detroit • Chicago

THE STANDARD LINE • Drills • Reamers • Taps • Dies • Milling Cutters • Center Reamers • End Mills • Rules • Special Tools

SAVE

without spending

MANY suggestions for reducing costs require additional capital investment.

Here's a way to save without spending.

Study your inventory of cutting tools—the number of different sources from which you buy—the number of requisitions issued to maintain stock from a number of sources—the time spent in keeping stock records—the time wasted in tooling up with tools of different operating characteristics.

Then consider the time and cost saving that can be made in every one of these and many other classifications by *Standardizing*. That is by specifying Standard Shield Brand Tools for your machine shop.

These tools are admitted Foremost Quality—we maintain a stock of over 10,000 items, with factory branches in important manufacturing centers. Leading Mill Supply Distributors coast to coast carry complete stocks.

You save without spending by Standardizing on Shield Brand Tools—call your Mill Supply Distributor today.

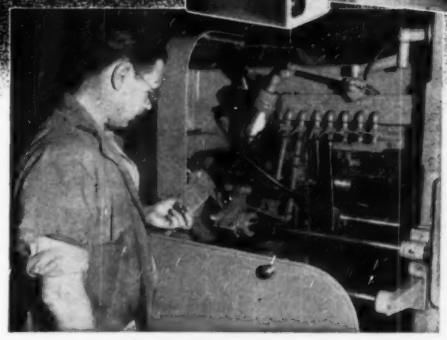
STANDARD TOOL CO.

Successor to The Standard Tool Company

CLEVELAND OHIO

New York · Detroit · Chicago

OUTPUT UP AS MUCH AS 400% AS VICTOR ANIMATOGRAPH CORP. installs WARNER & SWASEY *Automatics*



THEY SAY a satisfied customer is the best advertisement. Look what the Victor Animatograph Corporation, a division of Curtiss-Wright Corporation, manufacturers of fine movie cameras and projectors in Davenport, Iowa, report to their employees about the two Warner & Swasey *Camless* 5-Spindle Automatics they recently installed:

5-Spindle Bar Machines: 1¼" Standard Capacity, 2¼" Oversize Capacity. 5-Spindle Chucking Machine: 6" Swing.

***"... amazing speed and accuracy**

... output and efficiency increased extensively

... machines will pay for themselves in a short period of time

... production up 400% on some parts

... cycle time for many jobs reduced one fourth

... one job, which formerly required 3¼ minutes, has been cut to 40 seconds."

Full information on these new Warner & Swasey Camless Automatics will show you how their many new features and design improvements can cut costs, boost production in your shop. Ask your nearest Warner & Swasey representative or write Warner & Swasey, Cleveland 3, Ohio.

**From a feature article appearing in the employees' publication VICTORLIGHT.*

It's simpler **to set up a Warner & Swasey CAMLESS Automatic!**

WARNER & SWASEY Cleveland

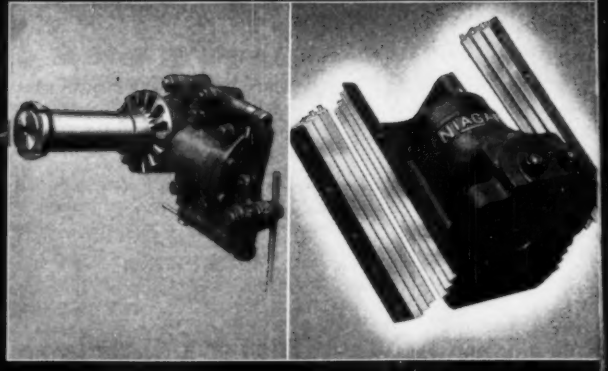
Turret Lathes, Multiple & Single Spindle Automatics, Precision Tapping and Threading Machines

ONLY

● You get the same advanced design in small Niagara Inclinable Presses as you get in the largest sizes. Don't overlook the importance of this because small presses run as much as 6½ times as fast as large presses. Regardless of size you get quality when you get Niagara Inclinable Presses.

Instant Engagement of the Sleeve Clutch as compared with the slower action of other mechanical press clutches produces more work strokes per hour.

Multiple "V" gibs provide more guiding surface which minimizes wear, maintains alignment of slide with bed and and thus increases die life.



NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

NIAGARA

SMALL INCLINABLE PRESSES

Give you all these

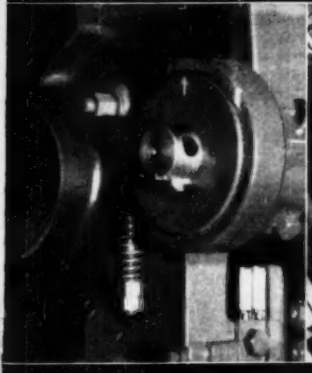
BIG PRESS FEATURES

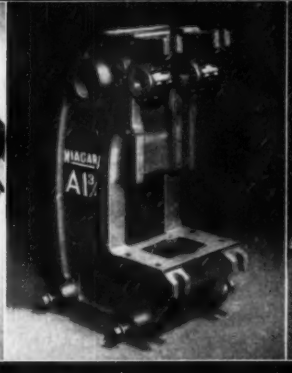
Brake automatically compensates for wear as well as expansion due to heat of operation. Drum and band marked to indicate correct adjustment.

Slide designed to assure solid backing for die from center to front as well as rear. Breech block die clamp gives solid backing to punch shoe.

Frame designed to provide solid gib mountings . . . strength at the crankshaft bearingsand a rigid gap maintaining close alignment of punch and die.

Inclining mechanism easily operated by one man. Working height is not materially changed when press is inclined.





DISTRICT OFFICES: DETROIT • CLEVELAND • NEW YORK

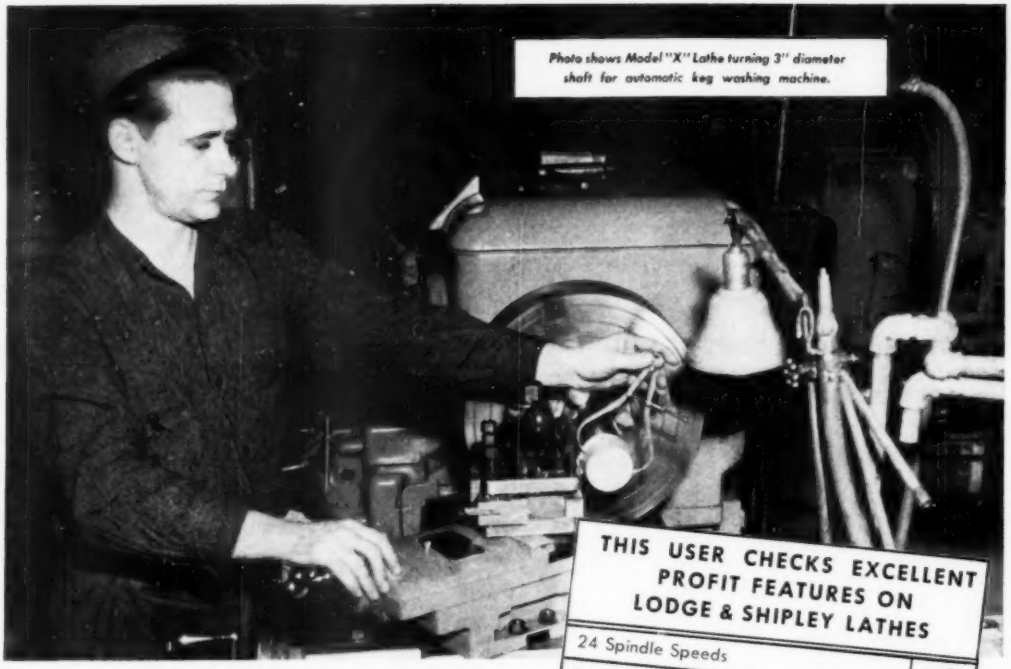


Photo shows Model "X" Lathe turning 3" diameter shaft for automatic keg washing machine.

"SPINDLE PRODUCTION INCREASED 50-60%"

...Report on Lodge & Shipley Lathe at Enzinger-Union Corporation

Manufacturers of Brewery and Chemical Equipment
Angola, New York

● Machining 3" diameter shafts for automatic keg washing machines, Enzinger-Union Corporation reports that the Lodge & Shipley Lathe is "a fine tool, capable of handling heavy as well as light work, with equal accuracy." In checking "very desirable" design features (tabulated at right) this user stated that "we are cutting a greater number of square thread spindles, 1⅞" O. D. x 10 mm. pitch, both in CRS and stainless type 303. Production of these spindles increased on this machine by 50-60%."

This data reflects the experience of many thousands of Lodge & Shipley Lathe users, who find these modern machine tools "accurate to a high degree", "excellent on versatility" and incorporating design features that make profitable operation as easy as it is important.

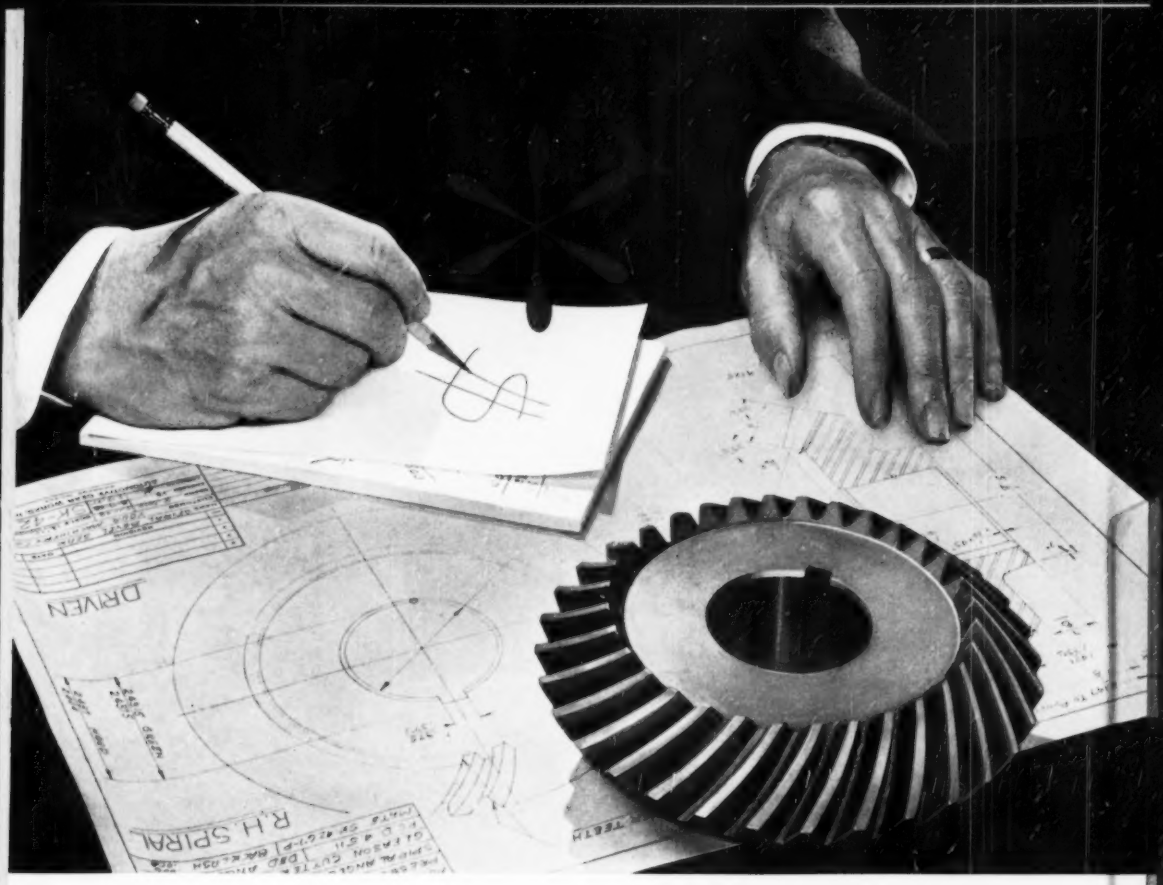
THIS USER CHECKS EXCELLENT PROFIT FEATURES ON LODGE & SHIPLEY LATHES

24 Spindle Speeds	✔
Horsepower Capacity	✔
Slide Rule Calculator	✔
3 Roller Bearing Spindle Mounting	✔
Ball Stop	✔
Hardened Cross Feed Screw Threads	✔
Compensating Cross Feed Nuts	✔
Apron Feed & Thread Interlock	✔
Complete Automatic Lubrication	✔
Hardened Steel Bedways	✔
Totally-Enclosed Quick Change Gear Box	✔
Heavier, More Rugged Design	✔

Let your Lodge & Shipley Representative show and explain newly developed, exclusive features like the "Slide Rule Calculator" which eliminates tedious figuring or guess work from speed calculations.

THE **Lodge & Shipley** COMPANY

MACHINE TOOL DIVISION • 3055 COLERAIN
SPECIAL PRODUCTS DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO



* What do you mean—"*How much?*"

You're buying gears. You naturally want to know "*How much?*"

How much what?

How much they will cost per unit on delivery? That's *one* important consideration, but not the only one by any means.

How much will they save on installed cost?

How much will they add to the saleability, performance, and endurance of your product?

How much (or how little) will they crowd tolerance limits?

How much will they relieve you of service headaches and expenses?

How much will they reflect the experience, integrity, and skill of their makers?

And how much will the manufacturer respect your delivery requirements?

When your "*How much?*" means all this—and not just first price alone—you're talking "Double Diamond" language. You're speaking of long-term value and long-term thrift, of lowest final cost. You're buying gears on the basis that has steadily built "Double Diamond" volume and reputation through almost thirty-five years of gear-making.

DOUBLE DIAMOND
TRADE MARK
GEARS

Made by

Automotive Gear Works, Inc.

RICHMOND, INDIANA

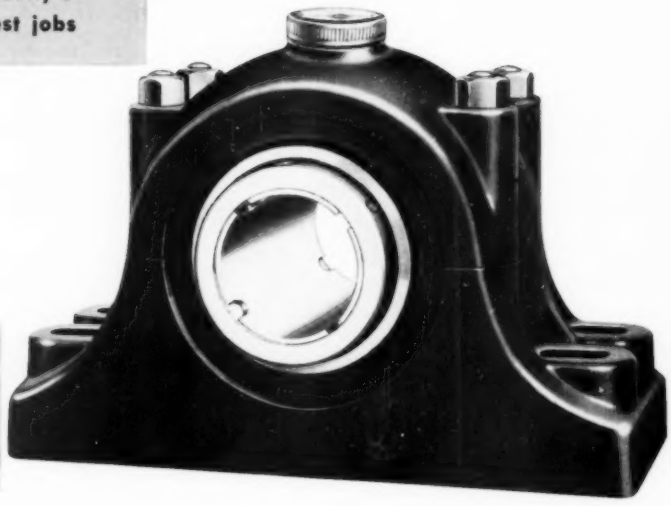
• • • • • FOR AUTOMOTIVE FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS • • • • •

*Reg. U.S. Pat. Off.

Quality-proved by use on millions of industry's toughest jobs

Mounted, sealed, housed, fully assembled, ready to lock on the shaft

Delivered from stock in 4 basic types and a vast range of sizes



"DODGE-TIMKEN" MEANS QUALITY!

OTHER DODGE "FIRSTS"

TAPER-LOCK SHEAVES
Easy on — easy off — holds fast to the shaft.

ROLLING GRIP CLUTCH
No toggles! Great flexibility — positive drive.

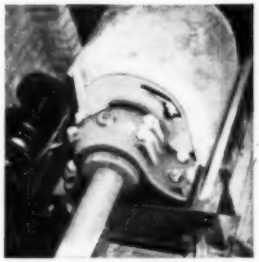
"SC" BALL BEARING
Pillow Block with new Neoprene metallic-backed seal.

It was Dodge who took the famous Timken Bearing, mounted it, sealed it, housed it and delivered a pillow block of new high quality—fully assembled, ready to lock on the shaft and carry the power loads of industry with new efficiency.

Power savings, improved machine operation, reduced maintenance, elimination of spoilage and steadier production—all result so regularly from the application of Dodge-Timken Bearings that this great line is widely accepted as the standard for comparison in up-to-date power transmission layouts.

Ask the Transmissioneer, your local Dodge Distributor, how these bearings and other Dodge "firsts" can help you achieve better, more economical production.

DODGE MANUFACTURING CORPORATION, MISHAWAKA, IND.



100-TON PULL

Three Dodge-Timken Pillow Blocks carry the load of a 100-ton pull of castings in and out of a shot blast chamber for the Falk Corporation, at Milwaukee. The bearings save the gear reducer from side pull and allow the shaft to turn easily even while taking the full load. Perfect operation for 8 years to date.

DODGE

of Mishawaka, Ind.

CALL THE TRANSMISSIONEER. Look for the name of the Transmissioneer, your local Dodge distributor, under "Power Transmission Equipment" in your classified telephone directory.

NAME PLATES

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY, ETCHING COMPANY OF AMERICA, 1520 MONTANA STREET, CHICAGO 14, ILLINOIS

it's free!

SEND FOR YOUR COPY TODAY

44 pages . . . six chapters of practical facts. Here is condensed information to give industrial executives a working knowledge of oil-operated or oil-controlled plant equipment.

Efficient, economical service from hydraulic mechanisms depends very largely upon the liquid which controls and drives them. This book tells the *how* and *why* of intelligent operation and maintenance.

FACTUAL...TO THE POINT... AUTHORITATIVE! 44 PAGES

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Shell Oil Company, Incorporated
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100 Bush St., San Francisco 6, California.
Please send me your book "Hydraulic Equipment."

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Company_____

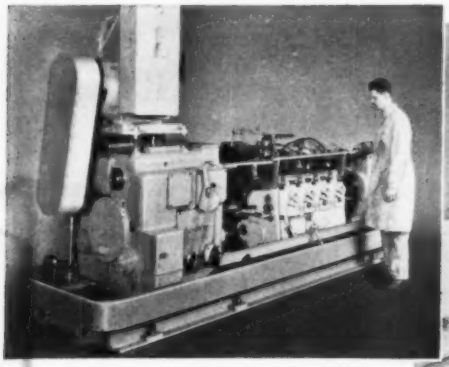
Address_____

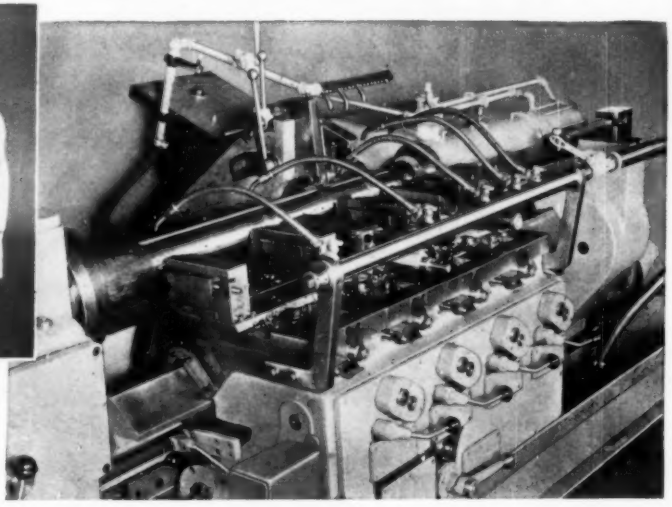
City_____ State_____

SHELL HYDRAULIC OILS

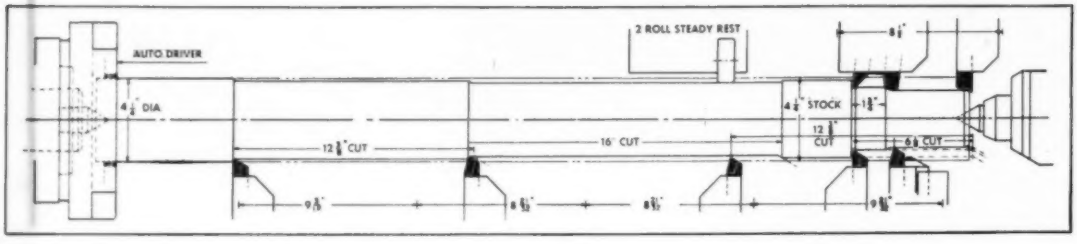
MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. **"THE Lo-swing PEOPLE"** SENECA FALLS, NEW YORK





MODEL "AP" Lo-swing LATHE MACHINES HEAVY SPINDLES



Problem: To rough turn, square and chamfer large spindles produced in small and medium quantities.

Solution: The new Model "AP" Lo-swing Semi-Automatic Lathe was selected for this job for several reasons. A large variety of work was to be put on the machine, hence change-over time had to be minimized. Also, overlapping of cuts was not permitted on the relief-turned diameter and the long cuts possible with Model "AP" solved this problem.

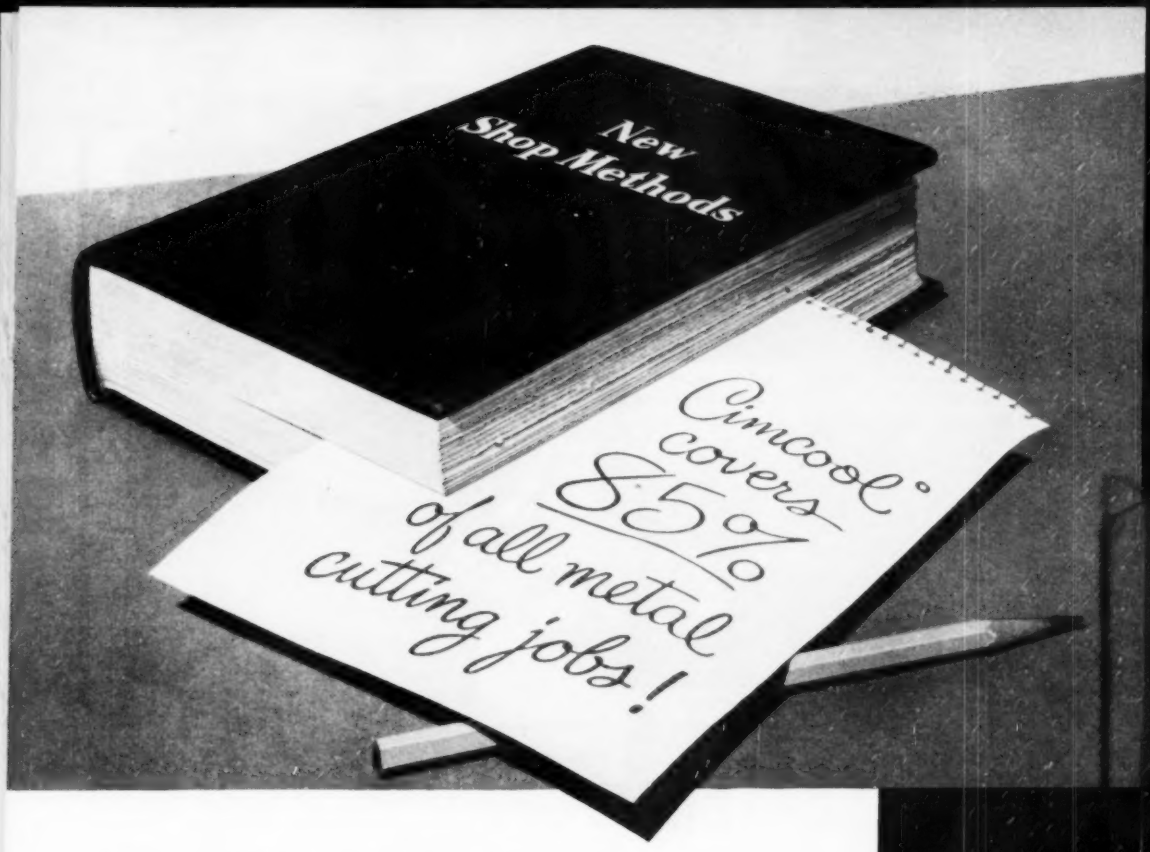
Turning is accomplished with five tools mounted on four independently-controlled, power-operated cross slides on the front carriage. Carriage can be rapid traversed to and from cutting position. Squaring and chamfering tools are mounted on the cam-operated, Back Squaring Attachment, which is automatically controlled and requires no attention by the operator. A hinged-type, two-roll Steady Rest prevents the work from springing away from the turning tools.

Because of its rugged construction throughout, Model "AP" is able to take full advantage of the tremendous cutting capacity of modern sintered carbide tools at high cutting speeds and coarse feeds. Investigate the many unique features of this new, semi-automatic lathe whose longitudinal carriage travel is limited only by its bed length.

Write for Bulletin AP-49.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH Lo-swing



One for the book

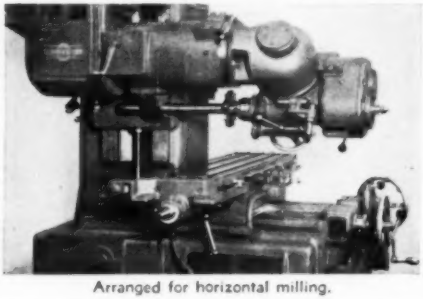
Yes, a new chapter is being written in shop practices. For Cimcool° covers 85% of all metal cutting operations. This revolutionary cutting fluid replaces all water emulsions and all but a few highly compounded specialty oils. And it *does a better job.*

Cimcool is different. It's a *chemical emulsion* that combines friction reduction and cooling capacity in a degree never attained by old fashioned cutting fluids. You get longer tool life, and there's less down time. Cimcool is longer lasting in machines, too . . . and reduces the cost of cleaning and changing. What's more, Cimcool permits faster speeds. You'll be convinced after one test run.

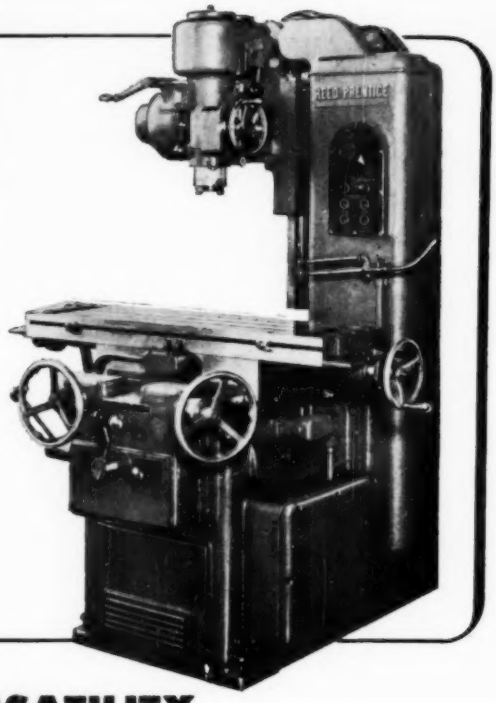
Write for free booklet, "CIMCOOL Gives the Answers." Address, Sales Manager CIMCOOL Division, The Cincinnati Milling Machine Company, Cincinnati 9, Ohio.

°Trade Mark Reg. U.S. Pat. Off.

Vertical milling; universal head swivels 45° front and back of vertical, 30° left and right of vertical.



Arranged for horizontal milling.



FOR GREATER VERSATILITY ... 12-V MILLER!

The **REED-PRENTICE** 12V Vertical Milling Machine offers you the utmost in versatility in your toolroom. This all-purpose 12V is a high speed miller, die sinking and boring machine — all in one!

In addition to its infinitely variable feed rates (electronically operated) and spindle speeds (variable speed mechanism) it is capable of vertical, angular or horizontal work through the use of a universal head. Head is mounted on an adjustable ram for greater range. Investigate this efficient miller today—write for information or descriptive folder to Department A.

SPECIFICATIONS

CAPACITY

Max. distance Table to face of spindle 18"
Max. distance Spindle to column 26"
Min. distance Spindle to column 12"

SPINDLE

Infinite speeds 90 to 2200 RPM; arranged for #40 NMTBA taper.
Vertical travel 5"

TABLE

Range:
Longitudinal travel 28"
Cross travel 12"
Feeds: Infinite per Min.
Longitudinal ¼" to 24"
Cross ¼" to 24"
Vertical, of ram 5/32" to 16"

Size:

Working surface 12" x 46"
3 T-slots (spaced 3") 11/16"

NEW YORK 6
75 West Street

CLEVELAND 13
1213 W. 3rd Street

REED-PRENTICE CORP.
MACHINE TOOLS
WORCESTER MASS., U.S.A.

LOS ANGELES 11
2314 Santa Fe Ave.

When you need

Special Steels FOR Special USES

check INGERSOLL first

Alloy Steels
Armor Plate
Clutch Plate Steels
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Shovel Steels
Knife Steels
Saw Steels, including
Hack Saw Blade Steels
TEM-CROSS Steel
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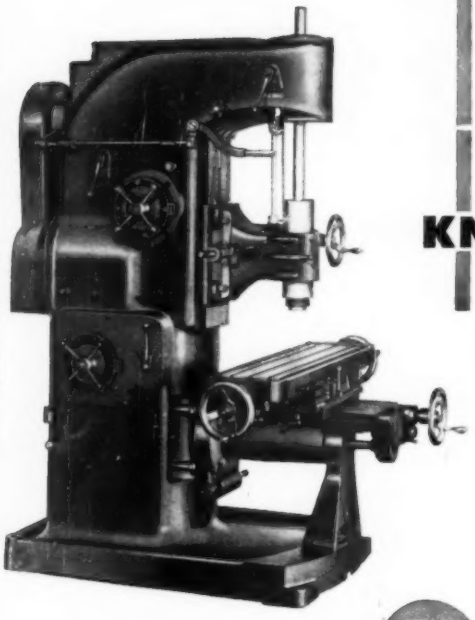
ENGINEERING B-W PRODUCTION

INGERSOLL
STEEL DIVISION

Borg-Warner Corporation • New Castle, Indiana
Plants: New Castle, Ind. • Chicago, Ill. • Kalamazoo, Mich.

it will pay you to know more about this versatile machine



if man-hours are a major factor in your cost picture, the Knight No. 40 will help you reduce them.

With a Knight No. 40 no special jigs or fixtures are required to handle the majority of your difficult boring, shaping or milling jobs. Flexibility and capacity, found in no other machine of comparable size, is provided by the tilting, swivel table, an unusually large working area, plus an exceptionally wide range of spindle and table feeds and speeds. Accuracy and long service far above the average are promised by the rugged, massive construction, wide bearing surfaces and precision gearing.

Time-wasting transfers of work, between two or more machines, are reduced to an absolute minimum. Set-up time is virtually eliminated. There are numerous other benefits, in cost reduction, increased output and product improvement, which you should know about. The coupon will bring you all the details without obligation.

KNIGHT NO. 40

for Precision Boring and Vertical Milling

Smaller machines of this type, No. 30 and No. 20, are available and shown in the Knight Catalog

ATTACH TO COMPANY LETTERHEAD

W. B. KNIGHT MACHINERY CO., 3920 West Pine, St. Louis 8, Mo.

We would like to have your catalog on the No. 40 and other Knight Milling Machines.

Name _____

Title _____

W. B. KNIGHT
MACHINERY COMPANY

3920 WEST PINE BLVD. ST. LOUIS 8, MISSOURI

SEE OUR CATALOG IN SWEET'S

KNIGHT VERSATILITY

MORE GOODS for MORE PEOPLE at LOWER COST

New Texrope Sheave Gives Lowest Cost

Instant Speed Control

- Covers most speed changing needs from 3 to 20 hp
- Very simple — one sheave does all
- Infinitely variable speed — 100% increase; 2 to 1 range.

THE NEW *Vari-Pitch* AUTOMATIC SHEAVE is the simplest, most economical method of instant speed control ever devised. You just move the motor forward to increase speed and move the motor back to decrease. The *Vari-Pitch* Automatic Sheave changes pitch diameter and holds the belts at proper tension *automatically*.

Now, you can cut unit costs by operating machines at most efficient speed . . . improve quality by compensating for material variation . . . with a very small investment in new equipment. Today, ask your A-C Authorized Dealer or Sales Office to give you complete facts and figures on how the new *Vari-Pitch* Automatic Sheave can save money in your plant. Or write for bulletin 20B7223. A-2767

ALLIS-CHALMERS, 999A SO. 70 ST.
MILWAUKEE, WIS.

Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

Sold . . .
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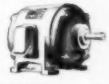
by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.



MOTORS — ½ to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

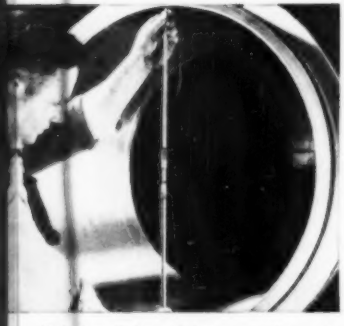
PUMPS — Integral motor and coupled types. Sizes and ratings to 2500 GPM.

ALLIS-CHALMERS

Layout Man Illustrates Adaptability of Lufkin Inside "Mikes"...

Lufkin tools meet exacting requirements of layout man, John Adams, employed for 14 years at the Mesta Machine Co., Pittsburgh, Pa.

● Every Lufkin Precision Tool has features that are of practical aid to skilled craftsmanship. Lufkin Inside Micrometers measure I.D.'s. from 1½" up. Each rod is marked with its length and rods can be added to either or both ends of the micrometer head.



Tubular, light weight measuring rods can be added to both ends of the micrometer head—thus keeping the head central and in balance—assuring more sensitive "feel" and precise readings.

Ground threads on micrometer heads assure smooth operation and greater accuracy. Rods and caps ground to extremely close limits to permit interchangeability. Heads have "Rapid Reading" (each thousandth numbered) to eliminate errors in reading. Lock nut holds measurement firmly.

Flat surface on knurled collar opposite reading line makes it easy to instantly find reading line even in poor light.

It is easy to adjust micrometer head. Extension rods that show wear are also adjustable by turning hardened and ground plug either into or out of the rod.

Buy

LUFKIN

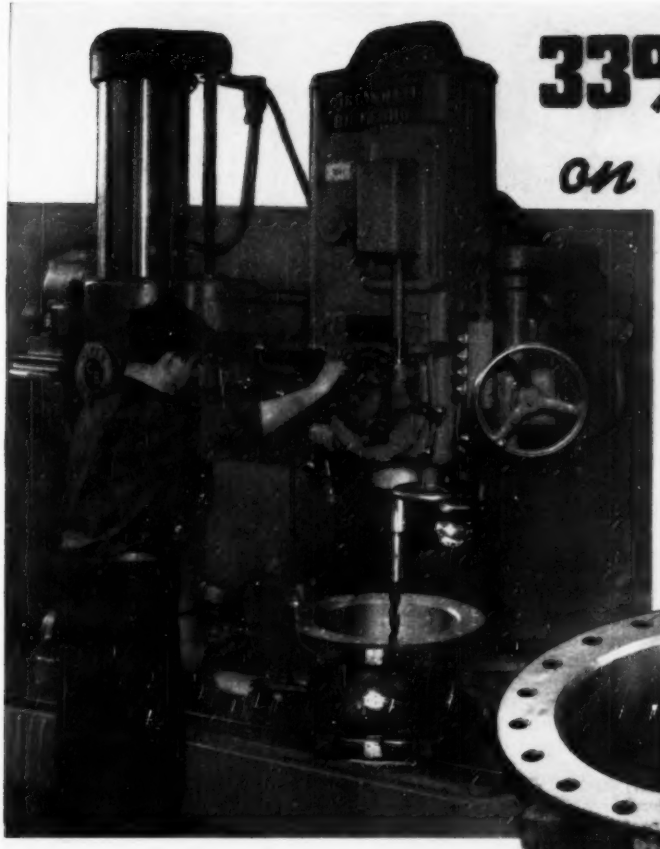
PRECISION TOOLS
TAPES • RULES
From your distributor

Write Dept. AM for fascinating booklet, "The Amazing Story of Measurement." Enclose 10c (no stamps) to cover handling and mailing.

THE LUFKIN RULE CO.

Saginaw, Michigan • New York City • Windsor, Canada

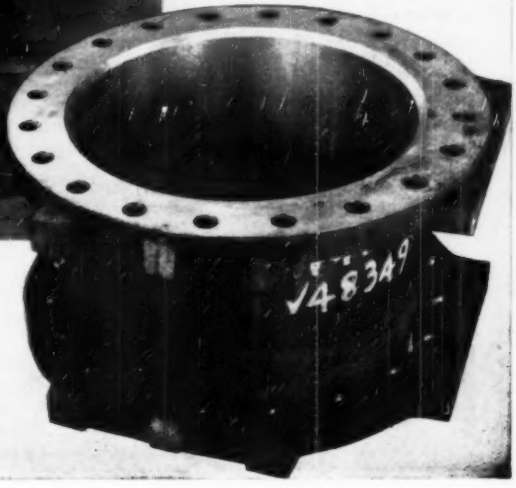
33⅓% SAVED on Cast Steel



Satisfactory experience with other Cincinnati Bickford Super Service metal drilling machinery induced The R-S Products Company of Philadelphia, Pa., to install this 4' arm 13" diameter Column Super Service Radial.

They say, "Ease of handling has reduced operator fatigue and consequently has increased his productive capacity."

On these cast steel Butterfly Control Valve Bodies the floor to floor time on the previous machine was three hours, this same job, is now being done in two hours—a 33-1/3% savings.



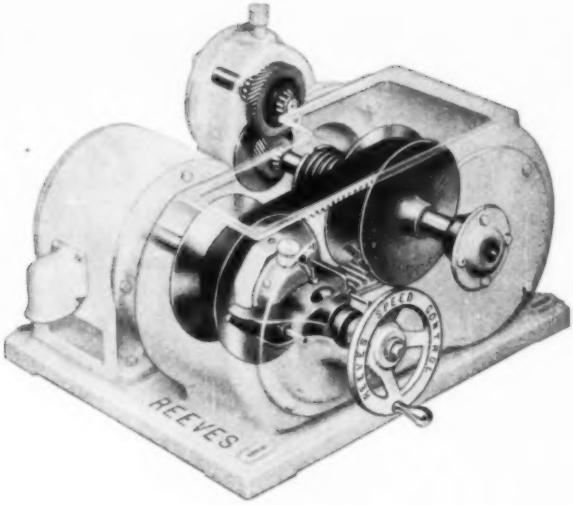
4' arm 13" diameter Column Cincinnati Bickford Super Service Radial, drilling forty 1-1/4" diameter flange holes through 1-3/4" - 20" diameter Cast Steel Valve Body.

Equal Efficiency of Every Unit Makes the Balanced Machine

Good judgment in selecting the proper machines, tools, and fixtures will consistently produce the best manufacturing results. Our CUSTOMER PRODUCTION ENGINEERING SERVICE in the metal drilling field represents the collective experience of many years (since 1874). Make your problems ours - - let us show you a profitable Radial or Upright Drill production application. Your most urgent production problems warrant our immediate attention.

THE CINCINNATI BICKFORD TOOL CO.
RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES
Radials 7½" dia. col., 2½' arm, to 26" dia. col., 12' arm.
General purpose Uprights, 21" to 28" sizes.
Production Uprights, 21" to 28"
Jig Borers, Portable Horizontals,
Spacing Table Machines

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio



CHAMPIONS — In the Field of Cost Reduction

In almost every industry, in thousands of factories and shops all over the world, certain machines are rendering championship service—performing unusually difficult jobs as if they were routine, and familiar every day jobs with greater ease and precision, because they are equipped with accurate, variable speed control —REEVES Speed Control.

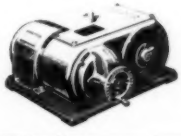
They are handling materials of widely varying consistency, weight, hardness and temperature . . . steel, textiles, rubber, foods, plastics, glass pharmaceuticals and many others. They are stamping, grinding, shaping, turning, winding, spreading, cooling, buffing, conveying and so on . . . some under the direction of skilled, experienced operators and others in the hands of awkward newcomers. But this they have in common: *all* 265,000 of these machines are equipped with REEVES Speed Control . . . *all* are performing each and every operation at exactly the right speed to get the best from man, material and machine . . . *all* are proving, through their day-after-day performance, that REEVES holds the key to improved production—cost-wise and quality-wise! They are proving that any good machine can be a champion—when equipped with REEVES Speed Control. Write for complete new catalog A16-G450A.

REEVES PULLEY COMPANY • COLUMBUS, INDIANA
Recognized Leader in the Specialized Field of Speed Control Engineering

THE THREE BASIC REEVES SPEED CONTROL UNITS

VARIABLE SPEED TRANSMISSION for providing infinite, accurate speed flexibility over a wide range—2:1 to 16:1. Sizes—fractional to 87 hp.

VARI-SPEED MOTOR PULLEY provides an instantly variable speed drive within 4:1 ratio for any constant speed motor. Sizes to 10 hp.



MOTODRIVE combines motor, speed varying mechanism and reduction gears in single unit. Speed variations 2:1 to 6:1 inclusive. Sizes to 20 hp.

Accurate Variable
REEVES Speed Control
Gives the Right Speed for Every Job!

SPOT NEWS OF METALWORKING

Buick hopes to capture from Plymouth third place in the automobile industry with its new 40 Series to be introduced in August. It will be the first revision of the 40 Series since before the war. Prices will be only moderately above the lowest-priced cars now on the market.

New electronic instrument, which guides a machine tool to cut out metal parts according to the drawing, is being marketed by General Electric's Special Products Division. The device, known as a "contour following system," simplifies production of irregularly-shaped metal parts, such as cams. Production of any shape can begin as soon as an accurate drawing is made.

Cathodic protection of ship bottoms in the "mothball" fleet is to be tried. Dow Chemical is providing such protection for two ships. Magnesium anodes are expected to be eaten away and replaced, but the ship bottom will be protected against rust. If successful, Maritime Commission will apply the treatment to thousands of ships in storage.

Wheel, hub and rim of automobile wheel will be riveted in one operation by using 5000 psi hydraulic cylinder riveters, according to a leading automobile wheel maker. High pressure allows nesting smaller cylinders. Savings will total thousands of dollars a year.

Warner & Swasey strike was called off June 28 by the IAM local in Cleveland. Pending new contract negotiations, men agreed to return to work on terms offered by company several weeks ago, with no provisions for maintenance of membership, no payment of union stewards for handling grievances on company time, and no pay increment plan. About 450 men already were back by June 28 as result of back-to-work movement started June 14.

An oil column can replace a metal punch for piercing and blanking sheet silicon steel, says GE. Soft steel is used as the die, so rapid wear of usual die steels is eliminated. Impulse pressure of the oil column is calculated for each job, and the oil channeled back for reuse.

Rolling of strip aluminum on a production basis will be started in August by Magnesium-Aluminum Division of Revere Copper & Brass at Baltimore. Heretofore only aluminum tube, forgings and extruded shapes have been produced by this division.

Long-range, inter-continental guided missile appears to be about 25 years away, states prominent Washington official who prefers to remain anonymous. At present, progress of defensive weapons seems to outweigh progress of offensive, foreshadowing trouble for long-range bombers.

About 20% of current automobile factory employment could be dispensed with if workers would turn out a fair day's work and if irresponsible absenteeism were stopped, in opinion of a prominent motor car maker.

British steel industry probably will buy scrap in western Germany at rate of 200,000 tons a month during the summer, now that the slump in U.S. steel output has eased competition for German scrap. British are paying $28.50 a ton, with possibility that fixed price will be cut.

Rotodip method of Bonderizing and painting used by Standard Motor Co. on its Vanguard car is to be made available in this country by R. C. Mahon Co., Detroit. Originated by Carrier Engineering Co., London, method calls for rotation of car bodies during passage through various dips to insure every corner and crevice being reached.

Gaging Metalworking

Metalworking output still is trending downward. Many plants are working only 32 to 35 hours a week with a single shift. Incoming orders show the stifling effect of users' policy of cutting inventories. Indications are that the lull in purchases will hold through the summer. Some companies are hopeful of a fall upturn. Others, however, appear confident and predict a further slide in business the remainder of the year.

Auto Output at Peak

Brightest spot in metalworking is the automobile industry. Instead of a decline in production this summer, Big Three schedules promise to stay at an all-time high. General Motors alone plans to turn out 12,500 cars and trucks a day every working day during July, August and September.

It appears probable that assemblies for the industry will be in excess of 600,000 units in July. August may be an even bigger month than July. The only barrier to attainment of new production records would be labor stoppages and a prolonged steel strike.

Car makers are more confident of continuation of a strong market than they were a month ago. Nevertheless new cars no longer are hard to get, except in a few popular lines.

"Hot" Products Easing

Business is beginning to ease in several so-called "hot" products. One is television sets. This year's production, to be sure, will be three or four times that in 1948. But sets have been built at such a terrific pace since January 1 that some leading companies have accumulated stocks and find it advisable to curtail operations temporarily.

▸ Diesel-electric locomotive activities are not so expansive as they were, except in the case of one company. The tractor and farm implement people continue to do a "land-office" business, but it shows signs of losing some of its terrific momentum.

Even in certain public utility equipment lines, demand has slid off somewhat. Big turbines and generators, however, have not been affected. Plants making such units are booked solidly for the next two years.

A slowing up of public utility construction programs is having an adverse effect upon many electrical products used in the public utility field.

Users Still Cutting Steel Stocks

The decision of almost all steel users to slash their inventories is being severely felt by steel mills (see *AM*, this issue, page 129). The disappointing news is that many customers say that they still do not have steel stocks down to the desired level and that they will not be in the market again for two months or longer. Meanwhile the steel ingot rate has been plunging downward and probably won't halt until it reaches 65% of capacity.

The sheet and strip market is very soft. Cold-rolled sheets are the sole exception, continued automotive requirements giving them strength not possessed by other items.

To illustrate the extent to which steel demand has deteriorated: one big user expected to take all the sheet steel it could get from the mills this year plus a considerable tonnage of conversion steel. As of today, its needs have dropped to a point where it is no longer an outlet for conversion steel and it is not ordering enough sheet steel to use the allocated tonnage offered by sheet mills at the beginning of the year.

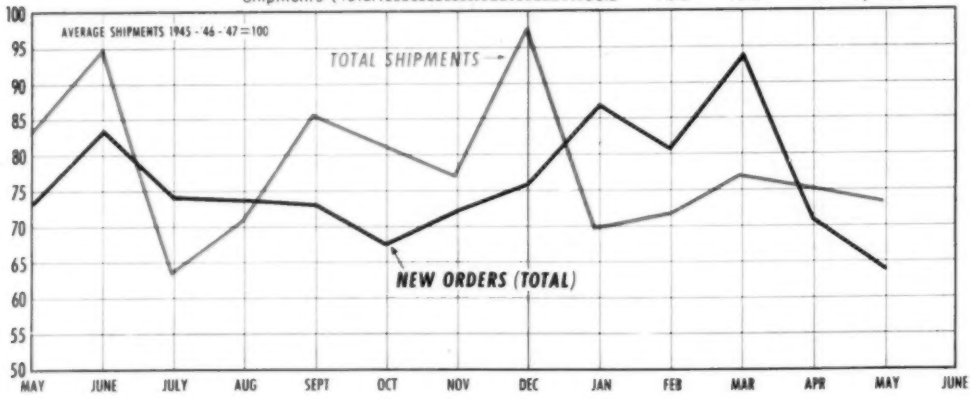
Moreover, this company is placing hardly any carbon sheet steel because of high inventories and during the fourth quarter it probably will require only about one-third of the amount originally estimated.

This case is typical of the situation faced generally by steel mills all over the country.

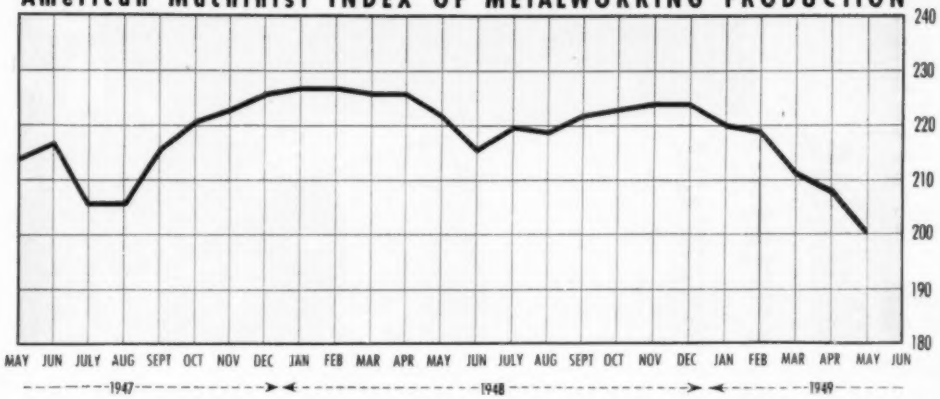
MACHINE TOOL SHIPMENTS FOR MAY DROP SLIGHTLY

Data: N.M.T.B.A.
(p—Preliminary figures)

New Orders (Total)	87.0	80.9	93.5	70.1	p63.7
Foreign Orders (Included in Total)	21.9	26.5	22.3	23.1	p15.9
Shipments (Total)	68.8	70.3	75.8	74.9	p72.8



American Machinist INDEX OF METALWORKING PRODUCTION



	INDEX	COMPONENTS				
		MACHINERY	ELECTRICAL MFG.	AUTOS, TRUCKS	TRANS-PORTATION EQUIP.	OTHER METAL-WORKING
May 1949 (preliminary)	200	209	196	206	283	138
Apr. 1949 (revised)	208	220	201	226	289	140
May 1948	222	251	229	225	289	144

AMERICAN MACHINIST'S INDEX OF METALWORKING is based on manhours worked in five segments, which are "weighted" as follows: Machinery, 32.5—Auto & Trucks, 22.6—Electrical Manufacturing, 15.4—Transportation Equipment, 12.4—All Other Metalworking, 17.1. Index figures are a percentage of 1939, which equals 100.

Steel Mills Have Lots of Coal

Steel forgings, billets and pipe are off to such an extent that delivery time has been drastically reduced. Cancellations, too, have been heavy. Steel mills are cooperating with many customers in scheduling deliveries so that the latter can maintain inventories as small as five-days' supply.

Steel price reductions are not anticipated until after current labor negotiations are clarified. Only reductions thus far have been on extras and, in certain cases, to meet a highly competitive individual situation.

Steel mills are not worried about a coal strike. It is believed that they have record-high inventories of coal —enough to run for 60 days in event of a long stoppage.

Non-Ferrous Demand Declines

Copper producers, like steel mills, are suffering from the current practice of users of working off huge inventories. One big customer, for example, has been taking deliveries at one-sixth the rate per month which it was estimated it would require at this time, the estimate having been made as recently as March.

Business of copper wire and brass mills is substantially down. Brass mills have lowered prices in line with reductions in copper and zinc.

Aluminum is in plentiful supply, in view of the slump in sales. The lead situation is similar to that in aluminum. Zinc manufacturers are cutting operations and closing mines. Congress has been asked to extend tin controls to June 30, 1950.

Machine Tool Demand Quiet

Though there was a slight pickup in machine tool orders the last week in June, the month is believed to have been below the May volume. Users appear reluctant to place business just now because of various uncertainties. Machine tool builders are not hopeful of much gain in bookings until late in the summer. Many compaines feel that the final four months of the year will bring an upswing.

Some dealers report that inquiries the past 30 days were considerably larger than at the same time a year ago. Foreign orders, especially ECA, are holding up well, comprising around one-fourth of the total.

Cutting tool sales have been only fair and probably will not change much in the immediate future. Distributors have sizable inventories which they are working off as rapidly as possible. Meanwhile, manufacturers have been compelled to reduce operating rates.

Gear Sales Decline

Sales of the gearing industry fell sharply in May. The decrease, to be specific, was 26.2% as against April. Nevertheless, incoming business still is 2½ times the volume during 1935-39 (May figure was 250.1).

Foundry equipment orders are down substantially, being less than one-half, in dollars, the amount a year ago. Sales are up somewhat, however, from the low point reached in February.

Industrial heating equipment is in fairly good demand, as customers find it desirable to replace old units with new cost-saving units.

Large motors are doing well. Manufacturers declare that production and sales should stay close to the current level the rest of the year.

Government Orders Aid

Government contracts arising from the aircraft program are helping to keep metalworking operations in certain sections of the country from declining more. One case: a company with an order for communications equipment is expected to double its working force between now and next April. In addition, it will take on about 150 subcontratcors around the country to produce components.

Household appliances are selling better at retail than many observers had anticipated. This activity is not reflected in manufacturing schedules because of huge inventories accumulated by producers over a period of months.

This MORRIS Horizontal Four Way *Hydraulic* Machine

••• DRILLS ••• BORES ••• CHAMFERS •••

AUTOMOBILE CYLINDER BLOCKS AUTOMATICALLY

● In line with the growing trend toward equipment developed for specific job requirements, Morris has produced this automatic hydraulically controlled machine for drilling, boring and chamfering automotive cylinder blocks.

This machine has both left and right hand side heads plus a rear head and one angular head. Each side head contains one spindle, the rear head has five spindles and the angular head one spindle.

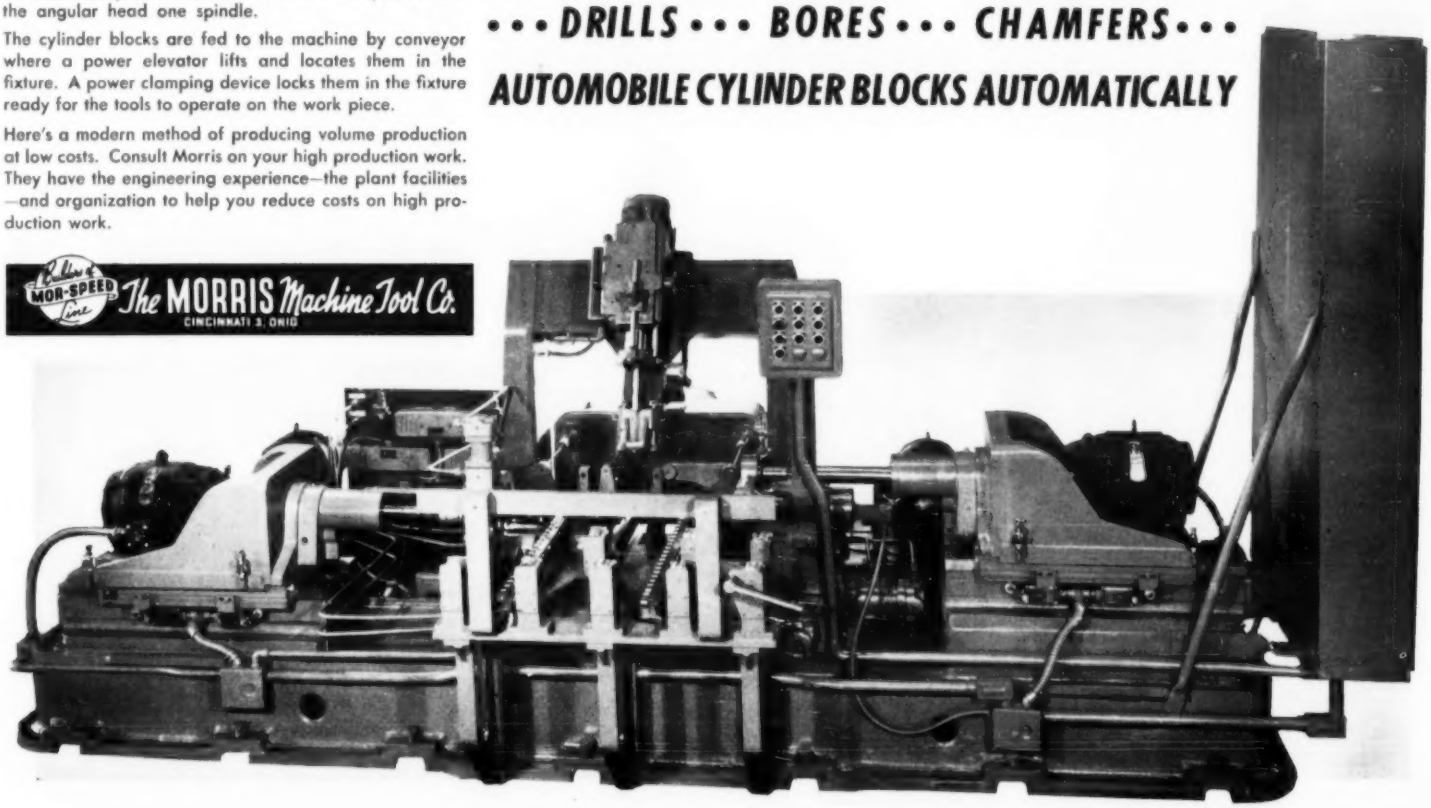
The cylinder blocks are fed to the machine by conveyor where a power elevator lifts and locates them in the fixture. A power clamping device locks them in the fixture ready for the tools to operate on the work piece.

Here's a modern method of producing volume production at low costs. Consult Morris on your high production work. They have the engineering experience—the plant facilities—and organization to help you reduce costs on high production work.

Builder of MOR-SPEED Line

The MORRIS Machine Tool Co.

CINCINNATI 3, OHIO



American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Proceed With Courage

Industry is in the midst of postwar readjustment. The business curve is heading downward. Orders are off, manufacturers are paring inventories, buyers are price-conscious.

Everyone wonders how deep the dip will go. Though bookings are lean in many metalworking lines, underlying sentiment is healthy. Few people think that the recession will last long.

Talk with any executive and he will tell you that the process now under way was inevitable. We could not expect to maintain the World War II level or the postwar boom created by wartime shortages of goods.

We should recognize, however, that the present orderly retreat from the heights to lower ground could readily be turned into something more serious if industry should adhere for long to a "wait-and-see" policy.

It is easy for fear to spread. And when fear comes in, facts and reason go out the window. The snowballing effect of fear multiplied among industrial managements could be vastly damaging to the nation's economy.

That is why we believe it incumbent upon metalworking manufacturers to be courageous and proceed without delay to carry out programs which, from a long-term point of view, will be beneficial to their businesses.

Lincoln Electric Co., to name a case in point, has announced that it will start soon to build a new plant in northern Ohio. Why? Because it has faith in the future of arc welding. It is convinced that the art of arc welding is in its infancy, that 10 years from now this particular welding process will be far more widely used than it is today. If Lincoln is to retain its proportionate share of the arc welding market and perhaps extend its portion, it feels that it must be prepared. The new plant will be a step in that direction.

Then there is the case of the southern Pennsylvania metalworking firm which has decided to build a new structure to house the manufacture of one of its products. Production of this item now is scattered and is expensive. When the new building is ready and new equipment is installed, the cost of making the product will be considerably lower than it is today.

The company will be in a better spot to compete for business and to reduce prices, at the same time making a reasonable profit. The president says, "It is smarter for us to get a handsome return on some of our idle funds in this way than to let the money stay in bonds or in the bank at a very low rate of interest."

These two metalworking manufacturers are showing vision and shrewdness. They are not letting a temporary drop in orders influence their plans for long-range benefits.

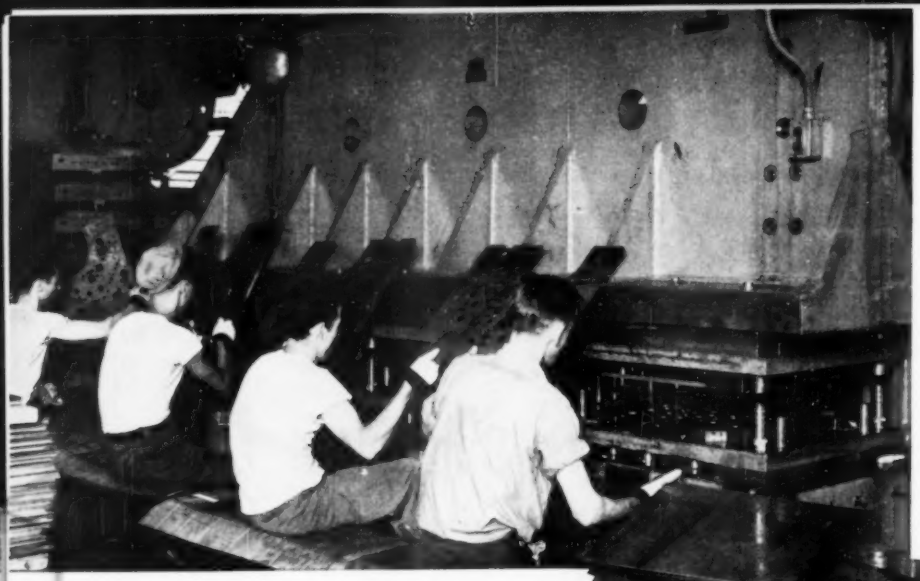
We urge other managements with sound programs for future development to follow suit. The worst thing they can do is to indulge in a prolonged period of "watchful waiting." If enough companies adopt a "watchful-waiting" policy, the effect can be alarming.

Bear in mind that Washington is keeping a close eye on the economic situation. If things should seem to get bad enough, the government will step in with expenditures and controls distasteful to industry.

The best way to avoid such undesirable action and to stabilize the business curve at a reasonably satisfactory level is for individual managements to go forward with logical plans for capital expenditures rather than postpone them. Now is a time for vision, courage and faith.

Burnham Finney

EDITOR



Passed from hand to hand, the work progresses from blank at right to completed part at extreme left. Two punching and notching and two forming operations are performed at each stroke of the press.

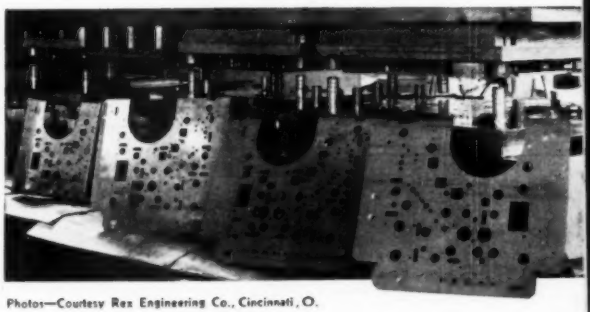
OPERATION TELEVISION...

This television chassis, a modern product made in the modern manner on a Cincinnati Press Brake, is produced from blank to completion in one stroke—four simultaneous operations on one machine.

281 holes, tabs and notches are punched, and three sides are formed at each stroke—to close tolerances.

Cincinnati wide beds and rams—either fixed or detachable—for large area work, are highly productive on jobs of this kind.

You may find you can do it for less on a Cincinnati Press Brake.



Photos—Courtesy Rex Engineering Co., Cincinnati, O.

Write for technical Bulletin 115, a compact treatise on Press Brake practice, dies and applications.

THE CINCINNATI SHAPER CO.

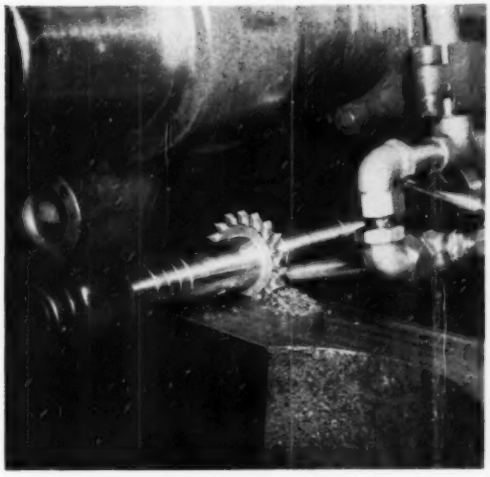
CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

PRECISION-CAST MILLING CUTTERS

COULD SOLVE A CRISIS

BY JOHN H. PENROSE
Director, Metallurgical Laboratory
and
CATHERINE T. AMOND
Metallurgist
WATERVLIET ARSENAL



Circular cutter, precision cast from reclaimed HSS, mills a test steel casting

Alloy shortages and consequent slow deliveries made the prompt replacement of broken tools and cutters impossible during World War II . . . Cutters precision-cast from tool scrap offer a possible solution . . . Here's a procedure and tests of the products

1 Pattern . . A master pattern was machined from brass stock with four sets of allowances for shrinkage: in the lead-tin-bismuth mold, in the wax pattern, in the refractories and finally in the steel casting. This pattern was set on three wax pins in the drag of a flask. Pins were stuck to the pattern and adjusted for length with an electric soldering iron so the parting line was at the tooth centerline

2 Plaster . . Hydrocal, a U.S. Gypsum product similar to plaster of paris, filled the flask to the parting line. After setting, which takes about 30 min, the parting line was dressed down by hand tooling. A thin sheet of latex rubber (0.0002 to 0.0005 in. thick) was stretched over the pattern and taped to flask edges to act as a parting medium (Austenal patent 2306516)

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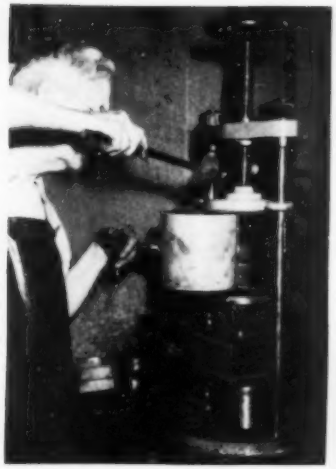

3 Lead Alloy . . The empty cope was placed over the plaster-filled drag and the two set in this special molding machine beneath a pouring spout to which they were raised by a screw-type base (adjustable to handle various sizes of flask). Lead alloy (25% lead, 50% bismuth and 25% tin) with very consistent shrinkage was melted and poured into a ladle spring-mounted on trunnions. The ladle, with a base valve, was swung horizontally 180° by hand for pouring. A screw top (next picture) seals the ladle so 30 to 40 psi air pressure can be applied to assure good definition around the pattern

4 Pouring Alloy . . After pressure pouring, the alloy is allowed to freeze. Then the mold cope can be removed, leaving the master pattern in the Hydrocal. Dowel holes are machined in the cope alloy after it cools, the pattern broken out of the Hydrocal and put in the inverted cope, the mold closed, with latex between as before, and the lower half poured. Dowels are thus formed, which insures proper mating and makes the Hydrocal procedure unnecessary for the drag. Mold surfaces are hand dressed and the sprue hole machined by a hand tool

5 Injecting Wax . . Mold halves are clamped together, the cavity sprayed with a soap-and-water mixture, and the mold placed in the lower chamber of this Arsenal-designed wax-injection machine. The lower chamber is evacuated to about 29 in. Bird-Moyer wax 1152 is melted at 160 F (± 5F, held by thermoelectric controls) in the top chamber. From this chamber the molten wax is injected into the mold at 15 psi air pressure to produce the wax pattern

6 Removing Wax . . Wax injection and all subsequent processing of wax patterns is done in an air-conditioned room to assure consistency in dimensions. Occasionally the parting line leaves a slight ridge, or some flashing occurs. Hand tooling corrects these errors, giving exact duplication of the master. Here the sprue filler is being removed

7 Mounting . . Pattern size determines how many may be mounted on the sprue for investing. In the case of the milling cutters, three provides a workable-size cluster for the furnace charge. The three patterns are "welded" to a wax-covered aluminum plug with an electric soldering pencil. The plug provides the sprue pattern

8 Precoating . . Mounted patterns are cleaned in alcohol, then precoated by dipping in a mixture of gum arabic, sodium silicate, water and a wetting agent (G.E. Ceremold, patent 70999). This holds the coarse placing sand sprinkled on to provide a bond for subsequent investment, as shown in the next step

9 **Sanded Patterns . .** Sand is sifted by hand from a height onto the pre-coated patterns, held over a large circular sheet-metal tray from which handfuls of sand can be taken easily and which will catch the excess. The cluster is then dried in air, which requires about 12 hr at room temperature, after which it is placed in a cylindrical sheet-iron flask for investment

10 **Investing . .** Flasks are invested with a mixture of 10% phosphoric anhydride, alcohol, magnesium oxide, and a mixture of placing, flat and flint sand (Jungerson patents 2211789 and 220049 on mold material and pattern). After vibration on a special table (shown), flasks are transferred to a tamping table and tamped to remove air bubbles. Supernatant fluid is decanted also. Flasks are air-dried for 12 hr

11 **Baking . .** Flasks are placed in a 200 F melting-out oven for 8 hr. This melts out most of the wax and permits removal of the aluminum sprues. They are then transferred to a furnace at 300 F. Temperature is gradually brought up to 1400 F, and there the molds soak for 8 hr. This burns out any residual wax and cures the investment ready for final pouring, which is done as soon as the flasks are taken from the furnace

12 **Melting Steel . .** Scrap toolbit inserts from large circular mills forms the basic charge in an Ajax high-frequency induction furnace of 17-lb capacity. Thus stock was heated to 2850 to 2900 F in about 30 min. No additions were made and chemical analysis of castings was: C 0.76, Cr 4.84, Mo 0.10, W 17.20, V 1.55, about that of an 18-4-2 tool steel

13 **Shaking Out . .** Liquitol, a commercial insulating compound, was poured over the sprue hole to slow solidification and thus allow a longer feeding time. After slow cooling in the mold, castings were broken out, sand-blasted to remove remaining refractory particles and the sprues cut off with an abrasive disk. Here is the cast cluster before separation

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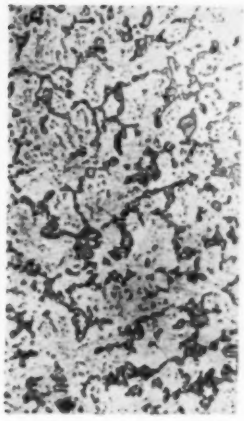
AS-CAST STRUCTURE



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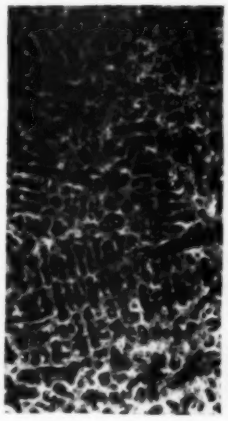
1 Microstructure shows characteristic dendritic structure well pronounced, with eutectic which is probably an iron-tungsten-carbide composition. Such a structure is ordinarily broken up by hot working, but hot working is impossible so the attempt was made to accomplish the same result by heat-treatment. All heat-treatments were made in a controlled-atmosphere furnace to minimize scaling and surface decarburization

SLOW-COOLED, QUENCHED, TEMPERED



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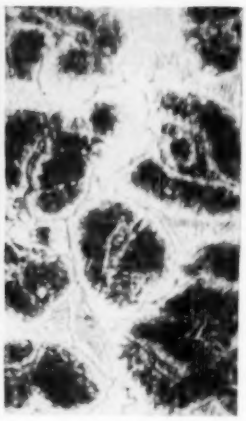

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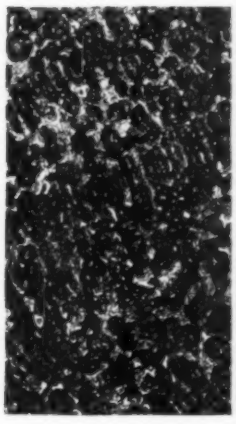
2 First treatment was to heat to 2300 F, hold there for 24 hr, cool in the furnace to 2000 F, then in silocel to room temperature. It was hoped thus to homogenize structure and break up the dendritic pattern. This failed, as shown, and the eutectic phase is still in evidence. An additional soak at 2300 F for 48 hr showed structure identical to this

SLOW-COOLED, QUENCHED, TEMPERED



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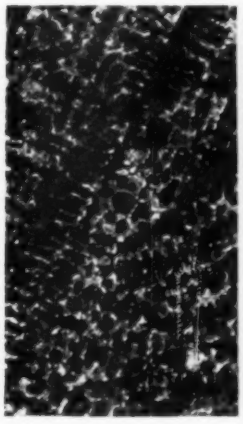
3 Standard heat-treatment was then given for this steel: preheat at 1600 F for ½ hr, heat at 2350 F for 3 min, quench in oil and double-temper at 1050 F. Dendritic structure was still present and massive carbides were out of solution. Apparently, the two previous treatments allowed so much carbide to precipitate that the quenching period was insufficient to re-dissolve it. Hardness was 50-52 Rc, far too low

ANNEALED FROM 1650 F



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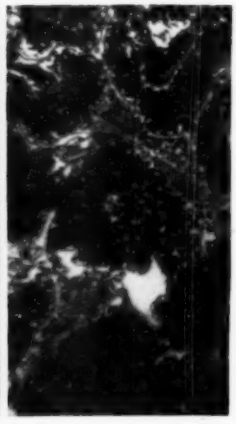

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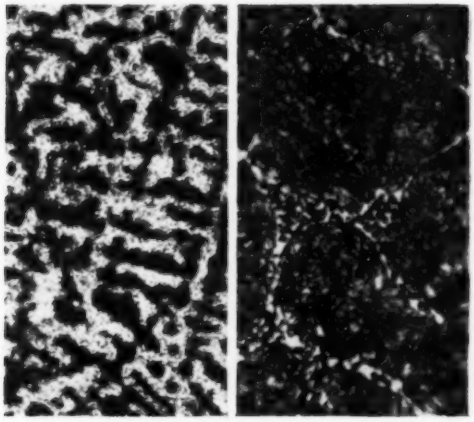
4 For further tests, a second "as-cast" cutter was held at 1650 F for 2 hr and cooled in the furnace to room temperature. Structure was then as shown here. After this, the cutter was preheated at 1600 F for ½ hr, transferred to a furnace at 2350 F, held at least for 3 min and then quenched in oil. This was followed by a tempering operation at 1050 F for 2 hr and cooling in air

QUENCHED AND TEMPERED



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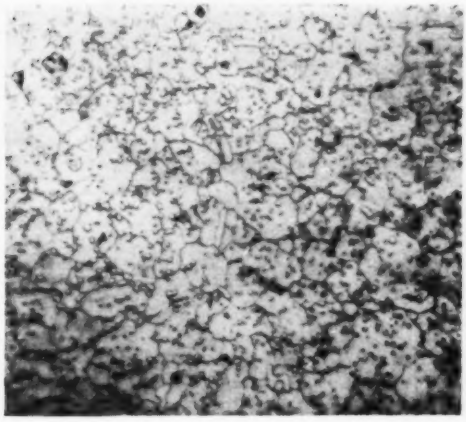
5 Microstructures resulting from quench at 2350 F and temper at 1050 F are shown here. Hardness is 62/63 Rc, normal for this heat-treatment. Dendritic pattern and iron-tungsten-carbide eutectic are still present, and carbide out of solution has precipitated at parent grain boundaries—probably because the hot work which ordinarily breaks up such a structure could not be done

COMMERCIAL FORGED CUTTER



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6 For comparison tests, a standard forged cutter of 18-4-1 analysis was run against the cast cutters. Sectionalizing after tests showed hardness of 61/62 Rc and this satisfactorily quenched and tempered structure. The setup for the machining tests is shown in the headpiece; stock was a discarded casting heat-treated to 207/212 Brinell. Results of the tests are in the accompanying table. All photomicrographs are picral etched

COMPARISON MACHINING TESTS

All cutters were 5/16 in. wide by 3-in. in diameter. Cast cutters were all heat-treated as described under photomicrograph group 5. Although this structure is that of a brittle steel, it was felt there was no advantage in a different one

CUTTER	RPM	FEED IN.	DEPTH OF CUT, IN.	LENGTH OF CUT, IN.	NO. CUTS MADE	TOTAL LENGTH, FT.
#1 Cast	35	1	1/4	14	54	63.
#2 Cast	35	1	1/4	14.5	61	73.7
Stock	35	1	1/4	14	42	49.0
#3 Cast	35	1 3/8	1/4	18	57	85.5
#4 Cast	35	1 3/8	1/4	18	63	94.5
Stock	35	1 3/8	1/4	18	39	58.5
#5 Cast	35	1 3/4	1/4	14.25	72	85.5
#6 Cast	35	1 3/4	1/4	14.25	63	74.9
Stock	35	1 3/4	1/4	15	17	21.3
#1 Cast	35	1	1/2	14	43	50.2
#2 Cast	35	1	1/2	15	37	46.2
Stock	35	1	1/2	14	32	37.3
#3 Cast*	35	1 3/8	1/2	14	23	26.8
#4 Cast	35	1 3/8	1/2	15	41	51.2
Stock	35	1 3/8	1/2	14	35	40.8
#5 Cast	35	1 3/4	1/2	14.	24	28.0
#6 Cast	35	1 3/4	1/2	14.25	27	32.1
Stock	35	1 3/4	1/2	14	21	24.5

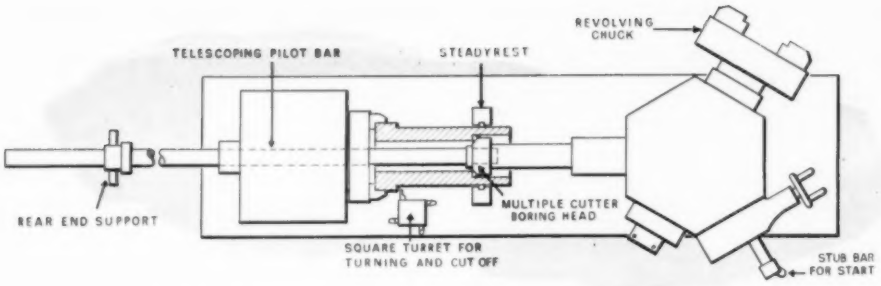
*Cutter failed by cracking through keyway slot.

SUMMARY

RESULTS of the machining tests would indicate that performance of the cast cutters is superior to that of the forged cutters. Tests were conducted in a laboratory machine shop, however, and to check performance fairly it is planned to use the precision-cast cutters in actual production work. By so doing, as much of the human element as possible will be removed, because the machinist will not be informed that cast cutters are being used.

All precision castings manufactured at Watervliet Arsenal are poured by gravity. Experimental work has been conducted utilizing centrifugal, gravity and vacuum methods for casting. For the major portion of components being cast at the Arsenal, it has been found that the gravity method is entirely satisfactory, as regards surface finish, definition, close tolerances, and soundness.

There have been cases where other methods would provide more satisfactory results, and the Arsenal is equipped to cast by the other methods when necessary. The gravity method permits pouring six to twenty molds per heat, however, rather than two to four by centrifugal means. This provides a closer control of chemical analysis for large quantities of the same component and insures uniformity in subsequent heat-treatment.



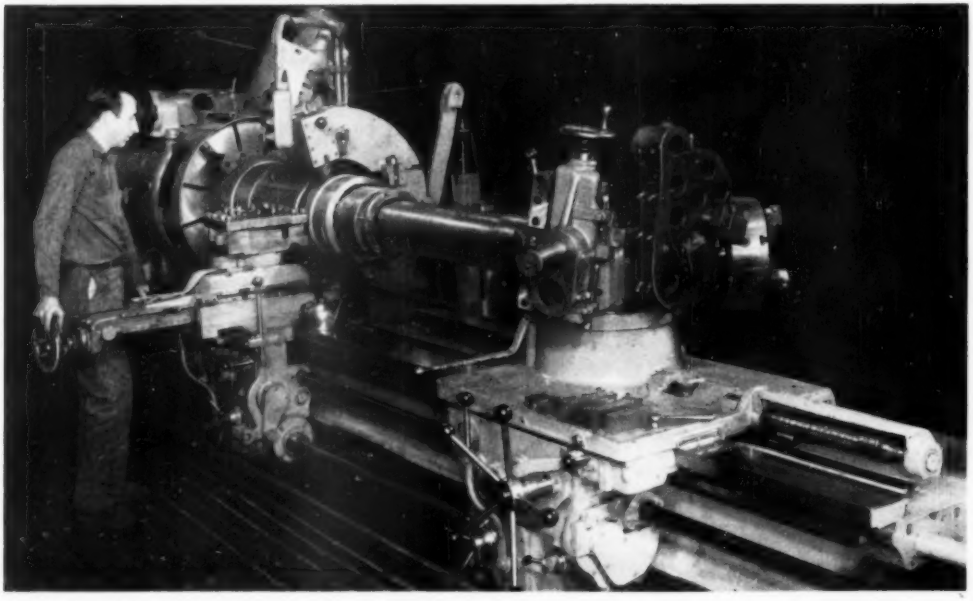
***Scroll chuck** on turret supports work while section is turned for steadyrest bearing. Stub boring bar starts the bore, and internally piloted multiple-cutter head completes the operation*

SMART TOOLS BORE HEAVY CYLINDERS

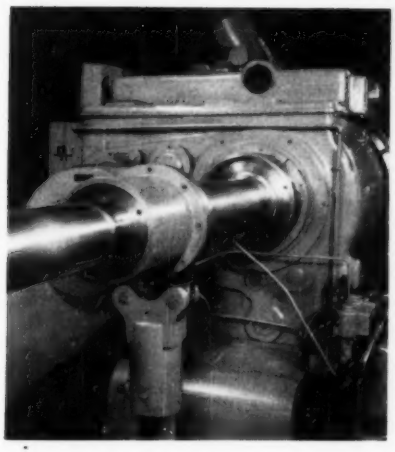
Two turret-lathe operations rough and finish machine cast-iron cylinder liners 15½ in. ID, 49 in. long, and cut costs 75%

BY J. F. STEVENSON, Asst Works Mgr., Cooper Bessemer Corp., Grove City, Pa.

APPLICATION of the split-pilot principle to a turret lathe setup enables production tolerances of 0.002 in. to be maintained on deep-hole boring of high-tensile-iron cylinder liners. Bores up to 15½ in. in dia and 49 in. long are being machined with only one rough and one finishing cut, holding exact size and surface finish for subsequent honing operations. Considerable floor space and handling equipment, formerly required when three machines were necessary, are now unnecessary, with a resulting substantial saving in cost. In addition, this tooling setup at the Cooper-Bessemer



Tooling layout for boring long, large-diameter cast-iron cylinder liners. Hollow boring bar is supported on telescoping pilot carried in bearings in the lathe spindle



Telescoping pilot bar projects from spindle hole and is carried on suitable supports. Hydraulic cylinder for positioning the bar is mounted on outboard bar support

Rough and finished engine cylinder liner. All machining operations are completed on turret lathes, except for honing. Material is high-tensile iron and bore is held to 0.002-in. tolerance

shop, Grove City, Pa., permits a shorter, more compact machine to be used, providing maximum rigidity for the unusually heavy cuts and with less space needed around the machine for indexing piloted tools.

Castings for these heavy cylinder liners are provided with chucking extensions and are gripped in a power-operated three-jaw geared scroll chuck. A driving lug cast on the extension prevents any work slippage under cut. With the outer end centered in a revolving three-jaw chuck, a bearing surface for the steadyrest is accurately turned from the square turret. The steadyrest is set up and a start boring cut taken with a stub boring bar to a depth beyond two small cored recesses in the casting.

Rough boring is done with a six-bladed inserted-cutter head mounted on a hollow boring bar made from heavy tubing for maximum rigidity with minimum weight. Pilot support for the bar is provided by an internal telescoping pilot or split-pilot. The latter is rigidly supported in antifriction bearings at the front and rear of the spindle and remains stationary while the spindle rotates. Longitudinal motion of the pilot bar is controlled by a hydraulic cylinder incorporated in the pilot mechanism.

At the start of the cut, the cutter head is positioned inside the rough liner and the internal telescoping pilot bar advanced to enter the bore of the cutter bar. During boring, the hexagon turret feeds under power, advancing the cutter head. The pilot bar is held in position by a 10-lb hydraulic pressure maintained behind it and moves back by the pressure of the turret feed.

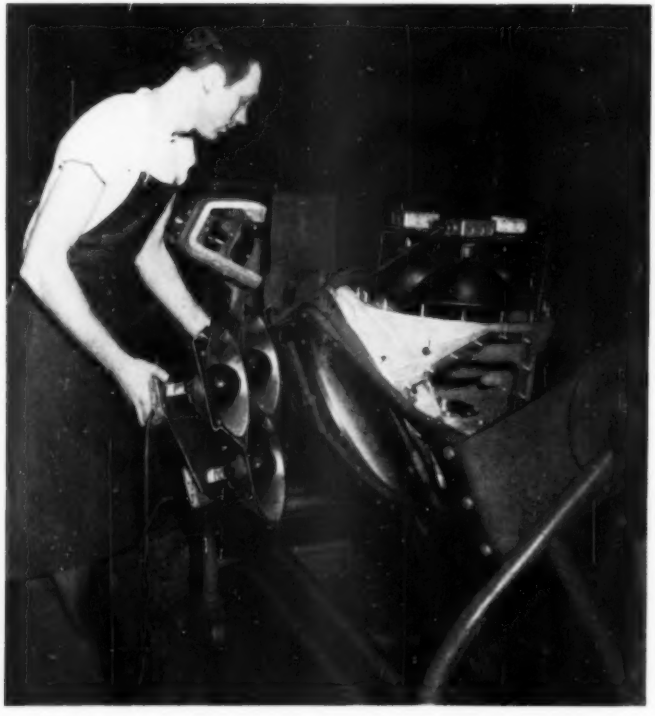
After the internal and external roughing cuts, the casting is cut off from the chucking ring with a parting tool in the square turret. An adjustable roller rest elevated to bear against the rough-turned OD near the chuck end absorbs the weight after cutoff. The liner, when cut off, comes to a stop without any deflection from the center line, eliminating tool breakage.

The work is then permitted to cool and later rechucked as a second operation in a three-jaw geared scroll chuck, using wide wrap-around jaws to prevent distortion. The steadyrest is again set up and the liner finish bored with a multiple cutter boring head using the telescoping pilot principle as in the roughing operation.

In rough boring, a longitudinal feed of 0.060 in. with a six-bladed cutter head is used. Depth of cut is ½ in., and surface speed is 250 fpm using carbide-tipped cutters.

"We're providing the plant with music—with this self-supporting unit"

Gravity chute feeds bronze seat castings for valve springs to J & L turret-lathe operator for complete machining. Bin is loaded from special lift-truck hopper, which keeps floor area clear of tote boxes. *Allison Div., General Motors Corp.*

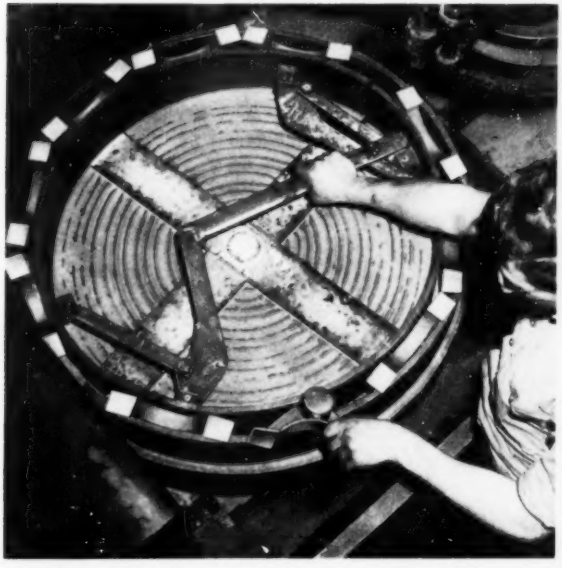


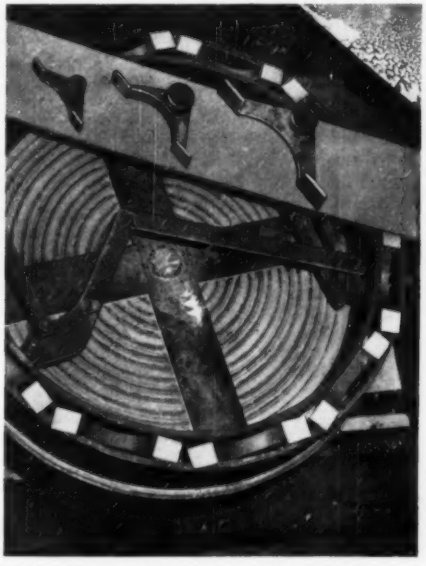
SHOP SHOTS

Hydraulic - transmission cases for GMC buses are heated for assembly of bearing races by direct radiation from banks of lamps. Reflector units with three 375-watt bulbs are clamped to the aluminum and iron castings and bring them up to 175F in 30 min. Trunnion-type fixtures simplify operations, which are faster than conventional press assembly. *Allison Div., General Motors Corp.*

Dial-feed press clinches Alemite grease-gun cylinder to nozzle sleeve by curling raised ridge on cylinder around sleeve rim. Bliss No. 20 press operates 18 stations continuously to produce 1000 parts per hour. Plate cam at right of dial lifts assemblies off fixtures so they can drop into chute. *Stewart-Warner Corp.*

Hot chips from a Gorton duplicator end mill are deflected away from the operator and the front of the machine by a small Plexiglas shield, supported on a single rod. Adjustment for rotation or height is made by loosening a setscrew which clamps the rod in a bracket on the machine head. Operator can watch closely milling cuts on small turbine blades. *Allis Chalmers Mfg. Co.*

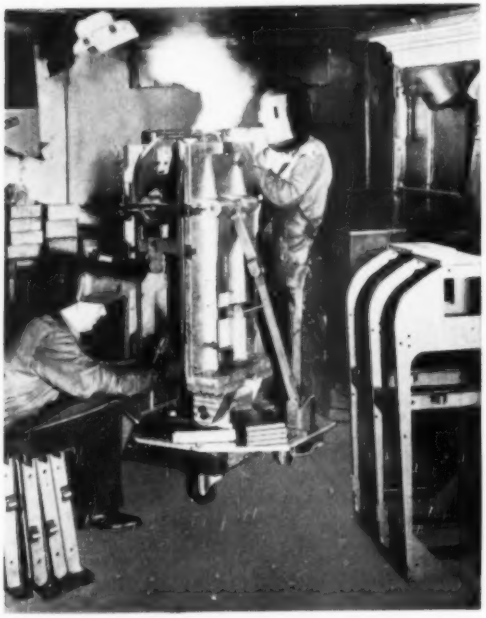




Toggle-operated fixture clamp on Blanchard No. 18-36 grinder aligns transformer tap-changer brackets so the feet will be surfaced at right angles to the sides. Brackets are located between two steel rings with feet up. Split inner ring forces bracket hubs against solid outer ring as operator hand-clamps lever. Outer ring is welded to two cross members which act as a fixture base, and inner ring is held in place by lever links. Three sizes of brackets are ground in batches by changing toggle links to suit. *Allis Chalmers Mfg. Co.*

ALUMINUM WELDING FIXTURE IS EASY TO HANDLE

BY W. S. HANSEN, Master Mechanic, Division I, Stewart-Warner Corporation



Alumnium welding fixture for frame units for new Alemite lubricators is adjustable for different sizes. Toggle clamp for hinged fixture plates permits easy opening and closing. In this fixture, baseplate is bolted to small square truck on four swivel-type Bassick casters. Ground cable is connected to fixture baseplate

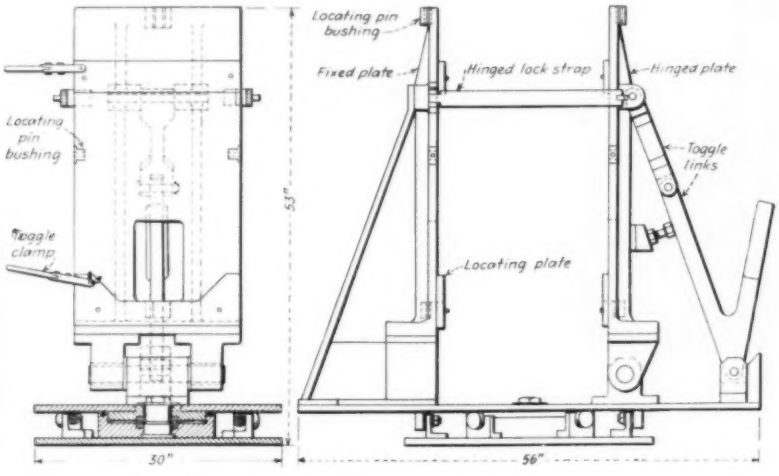
FRAMES for a new line of Alemite lubrication units for the automotive service industry are assembled by arc or spot welding in a new, integrated department at the Chicago plant of Stewart-Warner Corp. Made in different sizes, these frames have standard pressed-steel end members to which channeled separators are welded.

Accuracy of assembly is insured by clamping the members in a welding fixture which consists of two large aluminum plates mounted on a 30x56x$\frac{3}{4}$-in. aluminum baseplate. One vertical plate is bolted in position, while the other is hinged at the bottom to permit easy removal of finished frames. Movement of the hinged plate is accomplished with toggle links, which also lock it in the closed position.

The baseplate is drilled and tapped with a series of holes to permit mounting the fixed plate in several positions, as required for different sizes of frames. Because all major units in the fixture are made of aluminum, it is easy to adjust it for different part sizes, and to move it about the welding booth.

Fixture baseplate can be mounted on a small castered cart, or on a baseplate support assembly. In the second arrangement, the baseplate is centered on a vertical steel spindle supported by large steel members which are separated by a standard ball thrust bearing. Equally spaced around a 20-in. circle are four standard McGill cam followers, each supported in a right-angle bracket bolted to the lower member of the support assembly. This assembly is bolted to the floor of the welding booth, or to the deck of a small truck to permit moving it into and out of the booth.

Four standard De-Sta-Co toggle clamps are mounted on each fixture plate to hold the work in place during welding.



Fixed vertical plate can be bolted on baseplate in several positions, to accommodate frames of different lengths. Hinged vertical plate remains in one position on baseplate. Base plate support assembly in this design was developed for use where fixture is to be mounted permanently in center of welding booth

Select the procedure that will give satisfactory results with the minimum loss in production time

HOW TO CLEAN HYDRAULIC SYSTEMS

BY ANTHONY J. ZINC, JR., SWAN-FINCH OIL CORP.

THE REMARKABLE efficiency of our present-day hydraulic machinery unquestionably results from the high degree of engineering skill utilized in its design, manufacture, and construction. Meticulous care and supervision characterize each step from drafting board to final assembly.

Yet, despite this skillful engineering and fine workmanship, negligence in the operation of hydraulic equipment and indifference toward its maintenance can not only destroy its efficiency but can even tie-up production for weeks.

As was explained in a previous series of articles,* the successful operation of a hydraulic system is also dependent upon the selection and use of the proper fluid. However, with present-day designs, even the finest oils must be changed periodically and the systems cleaned of their contaminants.

The importance of having hydraulic systems absolutely clean before introducing a change of oil cannot be emphasized too strongly. Moreover, as each machine and its circuit is constructed differently, a different procedure for changing oil is required for each one. For this reason, hydraulic systems should not be tampered with unless their construction and operation are thoroughly understood by the service men. The general precautions described below will help in maintaining hydraulic equipment at peak efficiency.

New Hydraulic Systems

In the design of new equipment, the hydraulic circuit has become an integral part of the machine and is often well concealed within its structure. At the time of shipment, the manufacturer tests his equipment with rust-inhibited hydraulic fluids, drains the oil, and seals the circuit to prevent the entrance of contaminants. Upon receipt of this machine, it is unnecessary to flush the system. The usual recommendation is to refill with the proper grade of hydraulic fluid, operate the equipment for three to six months, drain the used oil, and refill with new charge.

Where the equipment is so large that it must be shipped in separate parts, it is suggested that each part be carefully cleaned, slushed with rust preventive, and wrapped. Then, prior to assembly, these parts should be carefully cleaned with a high-quality petroleum solvent to insure a dirt-free circuit.

Following assembly, the hydraulic system should be filled with the proper grade of hydraulic fluid and allowed to operate for at least six hours. Hydraulic fluid should then be drained, filtered, and charged back into the circuit. However, where adequate filtering equipment is not available, the oil should be discarded for new oil.

Three Basic Reasons

For machines in operation, cleaning is necessitated by three basic reasons. First, the moisture which has condensed within the circuit and become mixed with the fluid must be removed. Experience has shown that both entrained- and absorbed-moisture in a fluid can be serious as far as the life-expectancy of the fluid and the fine working surfaces within the circuit are concerned. The effects of this moisture are usually reflected in the precipitation of water-in-oil slimes, rust formations, scored pump and valve parts, and erratic hydraulic operation.

The second reason for changing oil and cleaning a system is the presence of such extrinsic contaminants as dirt, grease, cutting oils, and coolants, in the hydraulic fluid. Their presence is highly undesirable and can prove to be very costly.

Reason number three is the continuous use of hydraulic fluids with poor resistance to oxidation. Badly sludged pumps and valves usually result from operating with oils of this nature.

Unfortunately, as those hydraulic problems attributed to the above causes seem to arise when the equipment is in full operation, the master mechanic is invariably faced with a serious problem—how to clean the intricate circuit without expensive machine downtime, lost production, and high labor costs. Several important suggestions are offered to alleviate this situation.

Sludge and Gum Solvents

The first suggestion, which undoubtedly is the easiest to follow and is effective in most cases, is treatment of the contaminated oil with a hydraulic oil sludge-and-gum solvent. Several products have already been developed for this purpose and, after extensive field and laboratory tests by manufacturers of hydraulic equipment as well as of hydraulic oil, are highly recommended.

The customary procedure with products of this nature is first to

*"What to Look for in Hydraulic Oils," Anthony J. Zino, Jr., a seven-part series beginning Nov. 6, 1947.

drain the filtering unit and either clean the element or replace it, then add 5 to 10% of the solvent directly to the contaminated oil and allow it to function for a period of 100 to 150 hours in actual production. Following this procedure, the oil-solvent mixture should be thoroughly drained and the filters cleaned a second time. It is also advisable, at this time, to inspect the oil reservoir and remove any solids which might have precipitated and accumulated in the base. The system is then refilled with new hydraulic fluid and allowed to function with this oil until its next scheduled change period.

It is interesting to note that these newly developed sludge-and-gum solvents also contain oxidation and rust inhibitors. Their function is, of course, to inhibit the small amount of oil which remains within the lines and pumping equipment after draining and to prevent deterioration of the new oil.

Then Try Flushing

Where addition of these special solvents to the contaminated oil does not alleviate the problem, it is usually necessary to flush the system with a solvent-treated flushing oil. This flushing oil should have the following properties:

(1) A viscosity sufficiently high to adequately lubricate all moving parts and insure continuous suspension of particles during circulation. The necessary viscosity would be between 70 and 110 SUS at 100 F for systems equipped with either gear or vane pumps and 200 to 250 SUS at 100 F for systems equipped with piston pumps.

(2) Increased solvency to remove the various sludges and gums formed from the oxidation of the hydraulic oil as well as the coolants and cutting oils which might find their way into the circuit. It must not in any way affect either paint on the oil reservoir surfaces or packing.

(3) Rust and oxidation inhibitors not only to protect the system against further rusting during the flushing operation but also to inhibit the new charge of hydraulic oil when some of the contaminated oil has been allowed to remain behind.

When flushing the hydraulic system with a solvent flushing oil, it is usually advisable first to clean out the filtering unit and then to charge the entire system to at least 75% of its capacity with solvent-treated flushing oil. The system should then be allowed to function for a period of 3 to 4 hr without any actual production. After this period, it is advisable to drain the oil, clean the filter, and recharge with new hydraulic oil. However, prior to recharging, it is suggested that the reservoir be inspected and cleaned of any solids.

Finally Dismantle

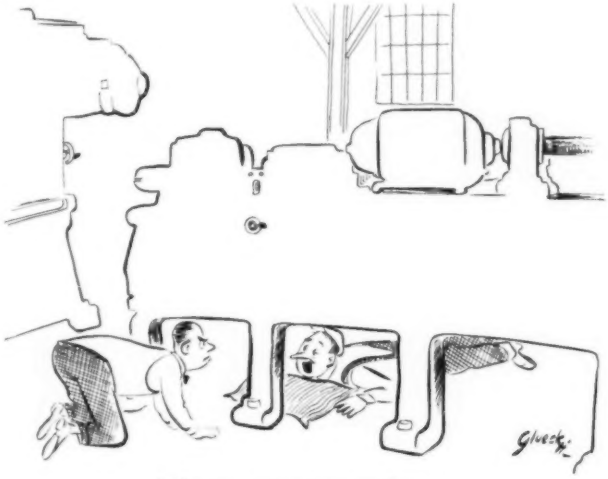
Where systems have been allowed to function with unstable as well as contaminated oils for a long period of time, and where the above two procedures have not rectified the problem, the only possible remedy is to drain the oil and completely dismantle the equipment and clean the system.

The method of removal depends largely on the size of the lines and other equipment, as well as the type of deposits. It is usually advisable to remove the hydraulic pump and valves first and to place them in a tank of sludge and gum solvent. They should remain in the tank for two to three hours while piping is removed. Then, after external surfaces are cleaned and dried, each operating component of the pump and valves is dismantled and inspected. Worn and damaged parts are replaced.

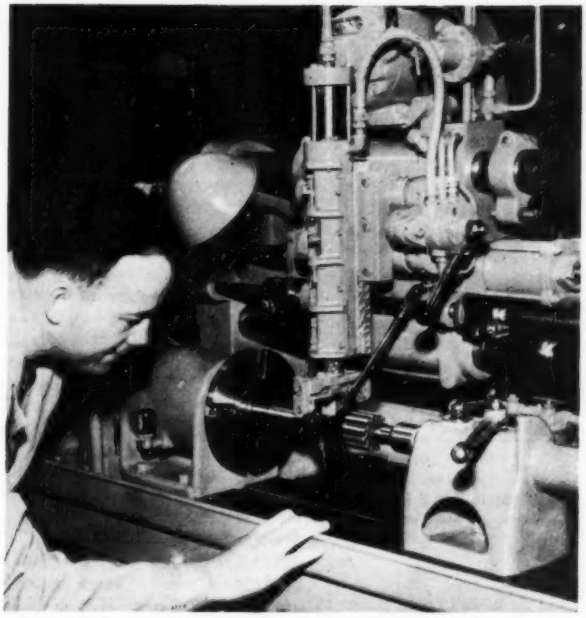
Where pumps equipped with anti-friction bearings have been in continuous service for at least a year, all ball and roller bearings should be replaced. Rebuilt pumps should be slushed with the rust-inhibited hydraulic oil to be used in this system and carefully tested before remounting.

The tubing can be cleaned easily with hot strong caustic solutions. The usual procedure is to immerse the tubing in caustic solutions at 180 to 200 F for a period of 15 to 20 minutes, rinse in hot water, blow out with air, then dry. If inspection reveals that deposits still remain, they can be removed by wirebrushing or rotary boiler-tube cleaners. Tubing, after final inspection, should be coated with a rust-inhibited hydraulic oil.

Freshly cleaned metal surfaces have a tendency to rust quickly, thus it is imperative that they be rust protected. After all parts have been cleaned, the system should be assembled using care to see that no dirt, lint, or pipe-thread compound gets into the system. As a final step it is advisable to flush out the system with a flushing oil.



"Why, boss, where have you been—
I've been looking all over for you."



Selection of the proper abrasive stone for Superfinishing is not difficult, once the factors to be considered are known, but is essential to the successful application of the process. Lubricant, work speed, and pressure on the stone also must be correct

How to Select Superfinishing Abrasives

Size of grit, hardness of bond, pressure, work speed, lubricant, and material and abrasive hardness, have a bearing on the quality of finish obtained

BY E. L. HEMINGWAY
Former Research Engineer,
GISHOLT MACHINE CO.

SUPERFINISHING operations are most successful when the abrasive stones are selected carefully. Kind and size of abrasive grit, nature and hardness of the bond material, and size and shape of the stones have controlling influences on the success of the operation.

The stones are made from the same grit materials and essentially the same bonds as are grinding wheels, but softer bonds and finer grits are employed. Vitrified bonds predominate, although in a few cases resinoid or shellac bonds prove useful. Both aluminum oxide and silicon carbide grits are used, in sizes from 120 to 600 mesh. Even finer grits (200 mesh and finer) are sometimes used to produce finishes of 1 mu in. or less, as on jewelers' rolls.

In choosing an abrasive to produce a given surface quality, these factors must be considered:

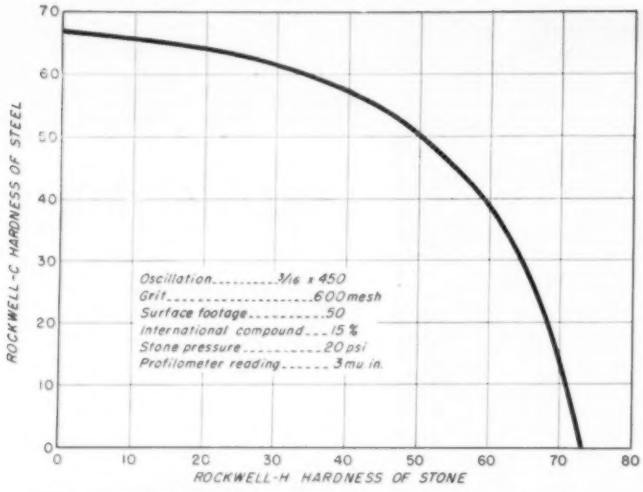
(1) The kind of grit most suitable for the material, (2) size of grit needed for the surface to be produced, (3) kind of bond to be employed, and (4) hardness of the bond.

The choice between aluminum oxide and silicon carbide is not difficult. Aluminum oxide is standard for Superfinishing steels, and silicon carbide is generally best for cast iron and nonferrous metals. There are but few exceptions to this rule. Aluminum oxide is faster cutting and better wearing and will produce a beautiful luster on most steels, but it is inclined to have a harsh cutting action on the softer metals, particularly on small-diameter work.

While slower cutting, silicon carbide is often employed on steels softer than about 30 Rockwell C, and for diameters under about $\frac{3}{8}$ in. Also, as silicon carbide can be made in finer grits in vitrified bond than can aluminum oxide, it can produce ultra-fine surfaces of $1\frac{1}{2}$ mu in. or less on hard steels.

Selection of the correct grit size is seldom a serious problem. Most Superfinishing is preceded by a grind finer than 30 mu in. rms, with a desired final finish of 3 mu in. or less. For these average operations, a 600-mesh abrasive has generally proved most satisfactory, in either kind of grit. When the final grind is rougher than 30 mu in. rms, it may be desirable to employ a 500-grit stone in the interest of speed. This may also be true with smoother grinds when a final finish of more than 3 mu in. rms is permissible. Grit sizes of 400 or 320 mesh may be used when a definite scratch pattern is desired for some special purpose. In some machines, where high rates of production are required—often from a turned surface—grits as coarse as 120 or 180 mesh may be used for roughing, followed immediately by 400-grit finishing.

It is not possible to predict with any accuracy the degree of smoothness that will be obtained with a given grit size. This depends upon the pressure on the stone, the speed of work rotation and the viscosity of the lubricant,



The Rockwell hardness test for stones has made it possible to select the proper bond hardness for various materials, hardnesses, shapes and surface conditions. Chart shows proper stone bond hardnesses for steel parts ½ in. and more in dia

as well as upon the grit size and bond hardness. An accompanying table gives reasonable limits under average conditions. With still coarser grit sizes, down to 120 mesh, finishes to 80 mu in. rms could be obtained by slow work speeds and soft bonds, but the same 120 grit will produce less than half that Profilometer reading under favorable conditions.

Selection of bond is an easy choice. Because it is faster and more reliable in its cutting action, vitrified bond is almost invariably used. While resinoid and shellac bonds produce very smooth surfaces, they have such slow cutting action that they are employed only for small diameters, usually ¼ in. or less; some aluminum alloys; or second operations on a few difficult metals, such as brasses and soft stainless steels, on which vitrified bond stones are used for roughing.

Selection of Bond Hardness

Determination of proper bond hardness has, in the past, offered more difficulty than any of the other factors involved. It has been made easier by the development of the Rockwell bond hardness test by the writer. This test can be applied with confidence on stones of 320 and finer grits. On coarser grits, it is sometimes erratic because an insufficient number of abrasive grits are contacted, yet it will be worth taking hardness readings.

Rockwell hardness tests of abrasive stones are made with a ⅛-in. steel ball and 60-kg load. In taking a reading, the operator should not wait for the dial needle to stop, but should raise the weight arm immediately after it has bottomed. The hardness number is read from the "red" scale. This combination of weight, indentor and red scale has been designated Rockwell "H" by the makers of the instrument.

Manufactured abrasive stones cannot be made to show uniformity in hardness as is found when testing metals. Some variation will be found in the best stones. A good stone should show 8 out of 10 tests within ±5 points Rockwell H of the expected reading. A little greater latitude may be allowed on soft stones—from 0 to 40 Rockwell H—but less variation should be expected on those from 60 to 80 Rockwell H.

A table of recommended Rockwell H hardnesses for vitrified bond stones to be used on steel parts ½ in. in dia and over is given herewith, but, just as in grinding, changes in operating and workpiece conditions sometimes make necessary deviations from these recommendations, usually toward a harder bond. Some examples are:

(1) Diameters of less than ½ in. require progressively harder bonds as they become smaller.

(2) Interrupted surfaces, such as journals with oil grooves, splined shafts, or reamers as an extreme example, require a bond hardness increased according to the degree of the interruption.

(3) Very roughly ground surfaces, which would wear a stone face rapidly, require a harder bond—perhaps 5 points Rockwell H harder than otherwise would be applied.

(4) Traversing requires a slightly harder bond than when the work is so short that traversing is not employed.

(5) Conical shapes must be Superfinished with a bond hardness of 65 to 80 Rockwell H.

When employing silicon carbide stones on steels, approximately the same bond hardnesses should be used as for aluminum oxide stones.

It has not been found possible to correlate the bond hardnesses of silicon carbide stones with the hardnesses of cast iron and nonferrous metals, as has been done with steels. As a starting point, it is recommended that a stone of 50 to 60 Rockwell H be selected for trial. Then the required hardness can be determined from the cutting action of the test stone.

Shapes of Superfinishing Stones

Cylindrical and conical shapes are finished with square or rectangular stick-type stones. These are usually supplied in 5 cross sections, and in 6-in. lengths. Some high-production operations make special shapes desirable, but the standard sticks can usually be applied to most jobs.

Two ¾x¾-in. stones in a double holder are usually employed for diameters from 3 to 7 in., and two 1x1-in. stones for larger work. However, none of the general recommendations need be considered hard and fast, and some deviation is permissible if the indicated size is not at hand.

Superfinishing sticks are often altered from the standard shape to meet special or high-production requirements. There are two reasons for this practice:

(1) To counteract dressing of an area of the stone face by its passage over a hole or other interruption in the work.

(2) To maintain straightness in a diameter, most often when there are shoulders at one or both ends to restrict the length of the stone.

Examples of the first case might be the pinholes in a piston, or a bearing that contains splines over only a portion of its length. Such interruptions have a tendency to dress the stone face and make it act softer than the balance of its contact area. It is desirable to narrow down the face by about one-half its width at the portion which passes over the interruption.

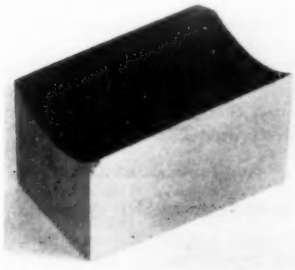
The most common examples of the second case are crankshaft bearings straight or even slightly larger in the center of the bearing length. All stones for this purpose are therefore considerably reduced in width at the center of their lengths. This principle is often found valuable in maintaining straightness and evenness in surface quality when Superfinishing many other cylindrical parts.

Stone Cutting Action

While a considerable range of cross-hatched scratch patterns (up to 80 mu in. rms or more) can be produced, a reflective, smooth surface is most often demanded. When the definite scratch pattern is desired for some special purpose, a continuously cutting stone of perhaps 10 Rockwell H points softer than usual is employed, with a somewhat lowered work speed. But where the smooth surface usually considered characteristic of the process is required, the stone face must undergo a certain progressive change during the short interval of the operation.

As the stone is first applied to the rough surface, it contacts only the crests of the waviness of the surface. Here unit pressure is high because of the small contact area and the grits will easily penetrate a lubricant of any viscosity to begin abrading the peaks. If the correct bond hardness is being used, the stone will, at this point, break down to some extent, exposing new, sharp grits to remove the peaks rapidly in comparatively large chips. The flow of lubricant has two purposes: (1) to cause more efficient cutting by the grits, and (2) to wash away abraded bits of metal and stone.

As the peaks are reduced and the entire surface becomes more smooth, unit pressure on the grits becomes less because more of them are at work over a greater percentage of contact area. It becomes increasingly difficult for the grits to penetrate into the metallic surface—and if they do not bite so deep, sufficient leverage is not exerted upon them to pry them out and thus keep the stone sharp. Instead, grits now remain in place and become progressively duller as the area of contact becomes greater and the unit pressure becomes less.



Blackened stone face at the conclusion of a Superfinishing operation indicates that the stone has the correct bond hardness for the combination of workpiece material, hardness, surface condition, and speed, as well as correct pressure and proper lubricant viscosity

Black Stone Face

Naturally, the dulling teeth of the stone remove progressively smaller bits of metal. Finally, these become so tiny they are immediately oxidized and are deposited as iron oxide in the pores of the stone. These deposits aid in building up a glazed face on the stone, and it is this glazing that produces an exceedingly reflective surface on the work. A black stone face at the conclusion of an operation is thus associated with correct bond hardness.

As the operation continues, the perfection in shape or conformation of both stone face and work surface finally becomes great enough that there is no longer sufficient pressure on the grit points to force them through the film pressure of the lubricant and further removal of metal ceases. Thus, if it is desired to produce the smoothest kind of surface, there is an automatic cycle of rapid stock removal, followed by a progressive production of reflectivity. Application of the same stone to another rough part will again break down the glazed face and the cycle will be repeated.

But, for the stone to function as described, it is necessary that a close correlation be maintained between the strength of the binding-together of the abrasive grits (or bond hardness) of the stone and the hardness of the metal. A given pressure on the stone will

ANTICIPATED FINISHES FOR DIFFERENT GRIT SIZES

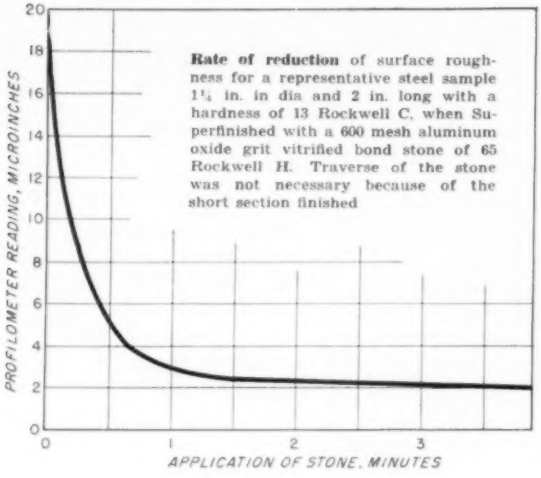
GRIT SIZE	FINISH USUALLY OBTAINED
600	1½ to 4 mu in. rms
500	3 to 7 " "
400	4 to 10 " "
320	6 to 20 " "

STANDARD ABRASIVE STICKS AND CORRESPONDING WORKPIECE SIZES

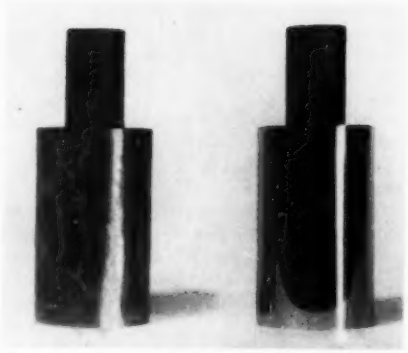
SIZE of ABRASIVE STICK	DIAMETER OF WORKPIECE
¼ × ⅜ in.	0 to 7/16 in.
⅜ × ½ in.	7/16 to 9/16 in.
½ × ⅝ in.	9/16 to 7/8 in.
¾ × ¾ in.	7/8 to 1¼ in.
1 × 1 in.	1¼ to 3 in.

RECOMMENDED HARDNESS FOR VITRIFIED SUPERFINISHING STONES FOR STEEL ½ IN. IN DIA AND OVER

ROCKWELL C OF STEEL	ROCKWELL H OF STONE
Chromium Plate	0 to 15
65 plus	15 to 30
65 to 58	30 to 40
58 to 50	40 to 50
50 to 35	50 to 60
35 to 15	60 to 70
15 and less	70 to 80



Rate of reduction of surface roughness for a representative steel sample 1¼ in. in dia and 2 in. long with a hardness of 13 Rockwell C, when Superfinished with a 600 mesh aluminum oxide grit vitrified bond stone of 65 Rockwell H. Traverse of the stone was not necessary because of the short section finished



Appearance of sample steel part after 20 sec (left) and after completion of Superfinishing in 60 sec (right) indicates how this process improves surface quality when all conditions are correct. A 600-grit, vitrified-bond, aluminum oxide stone was used for both these samples

obviously force the grits deeper into a soft metal than a hard one, and the bond therefore must be stronger in work on soft metals to prevent dressing of the stone when it should be glazing toward the end of the operation. A too-hard stone employed on hard steel would not be dressed fast enough to remove the grinding marks in a reasonable length of time.

The usual lubricant is compounded from a light mineral oil base, such as kerosene or mineral seal oil, together with 5 to 15% of a heavier cutting oil to regulate the viscosity—and thus the cutting action of the stone. The addition of a heavy straight mineral oil for this purpose is not satisfactory, and a water-base compound has never been found at all successful.

Adjustment of Variables

It is obvious that uncontrolled conditions seldom result in development of the correct cycle of stone action. Fortunately, variation in other factors can compensate for a certain amount of deviation from the exact bond hardness. Speed of work rotation and pressure on the stone are conditions usually subject to ready change. And these factors have considerable effect on the cutting action.

On parts short enough that traverse is not necessary, increasing the stone pressure, and/or reducing the speed of work rotation often will compensate to some extent for a stone that is slightly too hard. If neither of these changes give sufficient cut, it is a positive indication that the stone is too hard for the operation, and one of 10 points Rockwell H greater softness should be substituted.

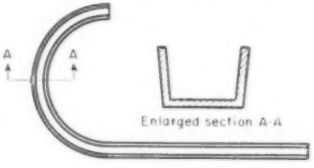
When the cutting action is too rapid, first reduce the pressure on the stone. If this does not sufficiently reduce the cutting action, increase the speed of work rotation. But if both procedures do not produce the desired results, it is proof that the stone is too soft and one of 10 points greater hardness should be employed.

Still another means for causing a stone to cut more rapidly is to just wet the work surface, then stop the flow of lubricant. A certain amount of stone debris will thus be retained on the work to dress and sharpen the stone. After removal of the grinder marks, resume the application of lubricant. Reducing the percentage of heavy cutting oil added to the lubricant will also cause faster cutting, but will reduce brightness of surface produced, and vice versa. However, this action usually involves more trouble than change of pressure and speed, and therefore is not ordinarily recommended.

How Would YOU Make This Die?

Here is a forming problem that has stumped some good diemakers:

No. 4 temper cold-rolled steel (0.025x¾ in.) is formed into a channel shape. Next, the channel must be formed to a radius (anything between 1 and 3 in.) without distortion. Wanted production rate is 300 pcs per hr.



Note: Curling dies and tools with loose mandrels have been used and are unsatisfactory in work produced and output.

Birth Rate

AMONG A FLOOD of reports of overproduced consumer-goods items and consequent layoffs, it is interesting to note that a manufacturer of children's toys has just made another substantial addition to his working force. The reason: Skyrocketing birth rates of the last several years have resulted in major increases in demand for toys and games.

How to cut costs with Value Analysis

BY L. D. MILES
Value Analysis Division, Purchasing Dept.
GENERAL ELECTRIC CO.

IS IT worth the money?—a timely question, and an important one. Important because the answer to this question can mean the difference between profit and loss for any company. Unless a company's product is worth its cost, it does not represent good value and cannot maintain its position in a competitive market. Timely because a competitive market is here. Management faces a challenge, and at General Electric management is acting. It is taking steps to make certain that G. E. products are worth the money. Specifically dedicated to this task, along with numerous other services and publications offered by the Company for internal use, is the Value Analysis Program.

Value Analysis represents an important concept in modern industrial management. Through Value Analysis, management makes Purchasing a full-time partner in cost reduction, and thus taps a reservoir of skill and knowledge that brings enrichment of value to all General Electric products. In Engineering, Value Analysis brings a new outlook to component parts design. It stimulates the cost-consciousness of every engineer to make certain that new designs include the latest advances in low-cost production techniques. For Manufacturing, to supplement the constant efforts of methods men and planners, Value Analysis represents a valuable new tool, extending the range of those responsible for dollar production and bringing their problems directly into the shops of suppliers. To any group in the company, Value Analysis offers a basic approach to greater value through principles and procedures universally applicable and readily understood.

What these principles are, how they are applied, and the results that have been obtained in representative case histories is the subject of this report.

Its success in General Electric is due not only to its basic soundness but to a large degree to the enthusiastic support of management at all levels in Purchasing, Engineering, and Manufacturing.

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

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What Is Value Analysis?

THE Value Analysis Program has two main areas in which it operates. One is the study of existing products, the other is the design of new products. In both areas, its major objective is equivalent quality at lower cost.

In the study of existing products, Value Analysis focuses attention on each part in the apparatus. It notes the function of the part, seeking to eliminate or simplify it, combine it with another part, or replace it with a standard item. It considers the material used to determine whether some other material offers better value. For the same reason, processes and manufacturing methods are examined, purchasing arrangements are reviewed, and the wares of specialized vendors and the services of specialized suppliers are scrutinized. The entire procedure is an intensive effort to uncover every possibility for greater value in the product.

Directly affected by these activities are Engineering, Manufacturing, and in fact, any part of the company that influences product cost. But Value Analysis in no way interferes with their normal duties and responsibilities. Value Analysis operates through trained specialists who work in full cooperation with each unit and constantly receive valuable ideas from them. Analysts investigate and uncover possibilities for savings. These are offered as *suggestions* to those who are responsible for making a decision and taking action.

In this way, there is no overlapping of functions, no areas of friction. And nothing is more important in the success of a Value Analysis Program. It is only through this smooth teamwork that it is possible to realize the tremendous savings the program can produce. Furthermore, this setup creates excellent relations with all other parts of the company, and permits Value Analysis to concentrate on its prime function—that of promoting and generating ideas for value improvement.

General Electric is organized with a central purchasing department, which buys certain generally used commodities and which is the "policy group." In addition each operating department has a purchasing group which buys materials peculiar to their operation. The Value Analysis central division assists and supports the activities of the various Value Analysis groups throughout the company.

Applies Purchasing Techniques

Noteworthy in Value Analysis is the emphasis on purchasing functions as a means to cost reduction. Stemming directly from this source are the following Value Analysis services: (1) supplying specialized knowledge of markets, materials, standard parts, processes, and costs, (2) extending the drive for increased manufacturing efficiency into supplier's shops, and (3) bringing the engineering skill and ingenuity of specialized suppliers to bear on company problems.

Of particular importance is point three—bringing to the company the best thinking of hundreds of process specialists outside the company. Among these are the specialized suppliers who have highly specialized tools and facilities which are available for contract work. Value Analysis, confronted with a tough problem, calls upon these vendors. Invariably, a solution is found.

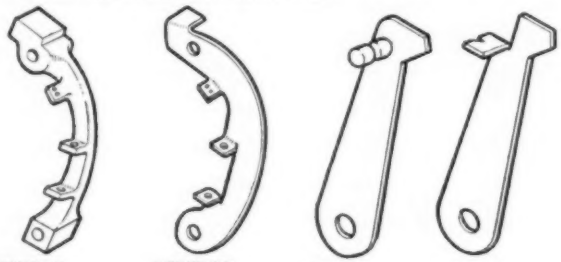
In turn, benefits accrue to suppliers not only in the form of the immediate order but also in establishing goodwill and a favorable reputation for future business. Furthermore, the value analyst oftentimes can offer a helpful suggestion on the internal operation in the supplier's plant.

Works Closely With Suppliers

If the cost of a purchased item appears too high, value analysts and supplier representatives go over the job in detail, discussing every feature that adds to its cost and evaluating changes that can be made to effect easier manufacture. Complete understanding of the job and its function often permits the supplier to effect appreciable sav-

Special Suppliers Enable Low Costs on Small Lots

High tool charges often prevent the application of low-cost manufacturing methods to small-lot, low-quantity production. Yet, there are suppliers with special equipment that enables them to do this class of work with low charges for tooling. Parts below illustrate what can be done through specialty stamping shops.



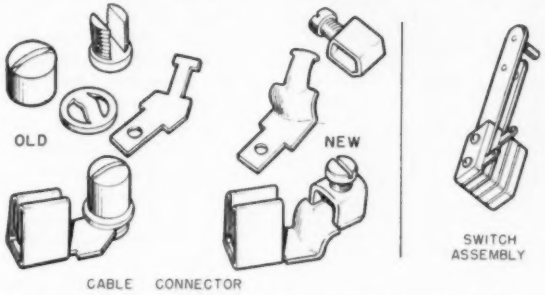
As casting, part required considerable machining and cost $1.76. Part, as stamping, costs 25¢. Tool charge was $100

Made as 2-piece assembly, pawl cost $1. Changed to stamping, cost is now 8¢. Tool charge at specialty shop was $50

ings. Knowledge of the supplier's problems and the reason for the cost of the job, in turn, often suggests what the company can do to make his task easier. In such negotiations not only do value analysts take part but also company engineers and manufacturing men who are responsible for making decisions on each of the possibilities as they turn up during the course of the discussion.

Sound, capable suppliers are an invaluable part of the program. Specialty fabricators, in particular, offer many opportunities for unusual and unexpected cost reductions. A most important task of Value Analysis is to learn of these suppliers and to establish sound working relations of mutual benefit to both parties.

Vendor's Standards Often Save Over Shop Parts



Cable connector was made of 4 parts produced within the company. Change to specialty vendor's standard cable connector parts saved 3¢ on each, amounting to $25,000 yearly

Switch assembly with parts made in the plant cost 90¢. Vendor was found who carried usable components as standard. New cost is 20¢

Improves New Product Design

The second phase of Value Analysis is its application in the design of new products. This is accomplished by the engineers supported by their draftsmen.

The engineers use Value Analysis as an additional tool to provide useful cost comparisons between usable products and processes, available specialized materials, applicable new products, and last-minute relationships of cost as their designs are jelled.

A well-organized program in their drafting divisions puts draftsmen on the team as dozens of decisions affecting cost—what tolerance to specify, what bushing to use, what fastener to use, etc.—can be properly made by a strong, highly qualified drafting group.

Major objectives in this program are: (1) to develop the cost-consciousness of all drafting personnel, (2) to acquaint all draftsmen with the principles of Value Analysis and the tremendous savings that result from their application, and (3) to encourage each draftsman to examine new designs as critically as the value analyst reviews existing products—with the ultimate objective that all new product designs include the latest advances in cost-saving practices. The Value Analysis group concerned with existing products lends full support to this program and contributes all helpful information at their command.

How to Analyze Existing Products

To be fully effective, Value Analysis requires a logical, systematic procedure. It is true that startling results sometimes come from spur-of-the-moment ideas. But for consistent results a definite pattern should be developed. In this way, no possibility is overlooked and the value analyst applies his efforts in the manner that is most likely to bear fruit.

Get All the Facts

The first step is to obtain full information on the job under consideration. This includes:

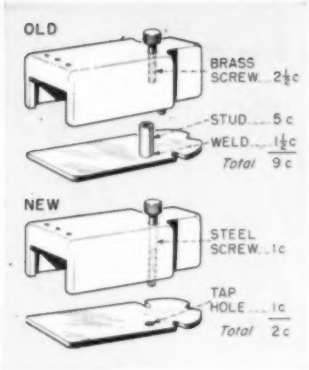
1. Annual production and ordering quantities.
2. Drawings and complete specifications.
3. Breakdown of costs on each part, including material, labor, and overhead, or if purchased part, name of vendor.
4. Breakdown of assembly and sub-assembly costs.
5. Copy of planning cards or general description of the process.
6. Actual samples of the individual parts and the assembly using the parts, where practicable.

This information is basic and essential for a thorough job. Complete data are the only sound basis for intelligent analysis.

See the Engineer

Next, the value analyst goes to the engineer directly responsible for the design of the product. Here is the man most intimately acquainted with the apparatus. With him the analyst discusses all aspects of the product: What the engineer likes or dislikes about it. Whether he has definite plans for redesign in the near future. Whether shortages may have dictated some of the material specifications. Whether there are changes the engineer contemplates but hasn't had time to check. Together they discuss the function and essential features of each part in the product.

In effect, the value analyst becomes a partner of the engineer, joining with him in the all-important effort to obtain a better



1 Does its use contribute to value?

In the assembly at top a brass thumb screw and screw machine part held the cover to the base. The stud, tapped on one end to receive the screw, was welded to the base. In new assembly the same purpose is accomplished by using a plated steel screw long enough to engage a tapped hole in the base and the stud is eliminated. Thus, the stud made no contribution to the value of the product

product at lower cost. The partnership in no way effects the engineer's authority or responsibility. It simply gives him another tool, extending his range and making it easy for him to obtain detailed information that was not so readily available previously.

This meeting is a most important step. Good value can be obtained in any product only if there is full cooperation among all who have a part in its manufacture. Value Analysis is not a means of checking on other sections of the organization, nor is it a fault-finding group. It is a service group that helps other sections with their problems.

Don't Miss the Pennies

The value analyst doesn't overlook pennies—1¢ each on 1,000,000 means $10,000; 10¢ each on 50,000 means $5,000.

Apply 10 Measures of Value

Having gathered all pertinent information concerning the apparatus under study, the analyst is now ready to weigh the value content of each piece in the product. This is the most critical step in the procedure for a wrong decision at this point may cause the loss of hundreds of dollars in unrealized savings. To minimize the danger of cursory analysis and snap judgments, the analyst follows a definite procedure for measuring value. This procedure is outlined in ten questions that have been crystallized from experience gained in the analysis of hundreds of jobs.

1. Does its use contribute to value?
2. Is its cost proportionate to its usefulness?
3. Does it need all its features?
4. Is there anything better for the intended use?
5. Can a standard or a vendor's standard be found which will be useable?
6. Can a useable part be made by a lower cost method?
7. Is it made on the proper tooling, considering volume?
8. Do material, reasonable labor, reasonable overhead, and reasonable profit total its costs?
9. Will another dependable supplier provide it for less?
10. Can anyone buy it for less?

Note the Function of the Part

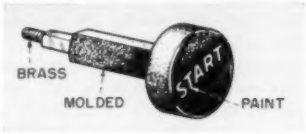
The first three questions are primarily concerned with the function of the part—its purpose in the apparatus. These are basic and should be considered first. There is little point in arranging to buy or make a part for less if it may be possible to save more by accomplishing the purpose some other way. Essentially these questions suggest the possibility of eliminating the part, combining it with another part, or simplifying it.

Consider Materials and Processes

Lack of material at the time of design may force specifications of something that gives less value than that which is now available. Further, new processes are developed and others improved such that over a period of years processes that once were best known for the job now represent less value than others currently available. Thus, question 4 refers specifically to other materials and processes.

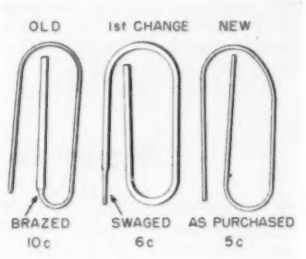
Check Manufacturing Methods

The fifth question focuses attention on the manufacture of the part, whether within the company or in a supplier's factory. As the analysis includes every piece in the product, many items will be made within the company. For these, the analyst has full information on labor as well as material cost. Careful analysis may show that the possibility for greatest



2 Is its cost proportionate to its usefulness?

On start button shown, the brass is obtained, machined and handled, the compound is provided, and the button is molded, packed and shipped to the using department for 3¢. Thus far, this is an excellent example of value. But when, in the using department, it was found that it cost an additional 3¢ to fill in the letters by wiping white paint on and off the face, this operation was pointed out as being unproportionately costly and worthy of further study



3 Does it need all its features?

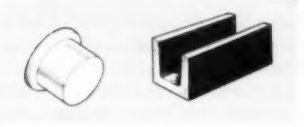
At left, is a control device made of copper tubing costing 10¢. The operating function required a large section at one end, but for assembly purposes a tube of smaller diameter was needed at the other. Hence, a large and small diameter tube were brazed together. At center is the first improvement costing 6¢. The same device was made entirely of large diameter tube with one end swaged to the proper size for assembly. Performance was the same. At right is the latest method. Tests proved that recent improvements in the instrument eliminated the need for the large diameter tubing. Small tubing throughout costs 5¢

savings lies in changing the method of manufacturing the part.

Methods are determined by such factors as drawing details and specifications, inspection requirements, production quantities, tooling and equipment available. The method may be fixed and production may begin without final exploration of an alternate method

4 Is there anything better for the intended use?

Special alloy springs for one job cost $15,000 for a year's supply, and the springs were not too stable. The equivalent spring in stainless steel is stable and costs only $9,000 for a one-year supply. Switch handle as a brass screw machine part cost 5¢ each. Same design as a miniature zinc die casting, brass-plated, is purchased for 1¢, including tool cost. On yearly requirement of 1,000,000 pieces, saving is $40,000, yet quality is equivalent



5 Can a useable part be made by a lower cost method?

Machined part at left cost 3½¢. With 0.005 in. additional tolerance on length, part is upset and Blanchard ground for 1½¢. Rubber part, right, formerly molded is cut from extruded stock at a saving equal to 2/3 former cost

6 Can standards be found which will be useable?

Nut on left is less than standard across the flats to avoid interference at the corners in assembly. Made in the plant, its cost was 15¢. Analyst found a suitable special as a vendor's standard. Cost 1¢. Added thickness of nut was no disadvantage. Brass eyelet cost $1.45 per M. Shoe industry uses standard eyelet which would do the job equally well. Cost for this vendor's standard is $0.89 per M

for producing a particular part. Such an investigation may reveal that slightly modifying the design will permit a much faster manufacturing method. The analyst, having complete information on the specific item and on the other items with which it is assembled, is in an excellent position to uncover such possibilities.

When parts are made by outside suppliers, the problem is somewhat more complex, as complete details are oftentimes lacking. But the "value approach"—asking, "Is it worth the money?"—will indicate those items on which the analyst should establish close contact with the supplier, study his detailed costs and methods, and jointly determine what can be done to improve his manufacturing methods.

Seek Vendor's Standards

Another big possibility for savings lies in the use of vendor's standards. Items that are not recognized national standards may yet be manufactured in large quantities and carried in stock at low cost by some vendors. Likewise, that which is a special in one industry may be found in slightly different form as a standard in another industry. Full knowledge of vendors and their standard items is essential to the value analyst. No one is in a better position than he to know the possibilities in this field. Question 6 insures that this opportunity will not be overlooked.

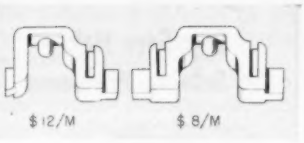
Note Tooling

Quantities change. Methods change. Available materials change. Still, too frequently tooling is not re-examined. As in question 5, whether a part is manufactured or purchased, its tooling must be examined. Thus, question 7 is asked.

In addition to individual cost elements, Value Analysis considers total part cost. To insure that all costs are fair and reasonable the eighth question is essential.

Select the Right Supplier

The ninth question focuses on vendor selection. Knowledge of



7 Is it made on proper tooling considering volume?

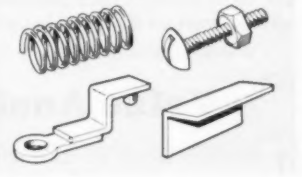
With lot-sizes in the millions, plastic part at left cost $12 per M, while that at right, in lower quantities cost $8 per M. Why? $12 one was first and was tooled with best known molds. Other part, tooled later, utilized an interim advance in the science of mold design. It was found that new molds would save their cost each in 4 weeks

8 Do material, and reasonable labor, overhead, and profit total its cost?

Shaft has material cost of 3¢, no close tolerances, and total cost of 50¢. Obviously the cost is not reasonable. Job is now bought outside for 15¢ complete

9 Will another dependable supplier provide it for less?

Springs formerly cost $4.50 per M. Careful ordering and the right vendor selection reduced the cost to $2.50 per M. The saving on this one small item is $100 per week

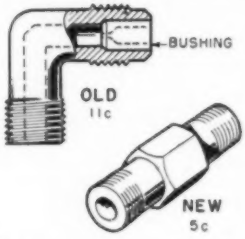


10 Can anyone buy it for less?

Except for proprietary processes, the analyst must satisfy himself that the answer here is always "No"

vendors and their particular abilities is of the utmost importance to the value analyst. It is his duty to determine who is best equipped to render the service that is being bought. And in what quantities

Suppliers Help In Solving Problems



Conferences with suppliers often turn up helpful suggestions for greater value. For example, fitting originally was an elbow, made of 2 pieces at a cost of 11¢. First attempt was to make the part in one piece, but cost then went to 12¢. Next, value analyst and supplier set 5¢ as their bogey and found that only way to meet bogey was to make part straight. Investigation showed that bend readily could be made in part, to which fitting is connected. Countless jobs have been improved through the planned conference method

and on what terms the best price can be obtained. It is not enough to know dependable suppliers, the analyst must know how to stimulate their thinking—how to help them obtain greatest efficiency in their shop. It is not the purpose of the value analyst to put unreasonable pressure on suppliers, but it is his purpose to make them think.

And, finally, in question 10, comes a very important point—"Can anyone buy it for less?" Except for proprietary processes, the analyst must satisfy himself that the answer here is always "No."

Basic Questions Lead to Others

These are the ten basic questions in Value Analysis. On a given part, they may open no avenues to greater value,—but if not, the part is worth the money. On the other hand, they frequently lead to several suggestions for lower cost at equivalent quality.

Examples for each of the ten basic questions are intended to clarify the intent of the question and to illustrate the type of action that may result.

Likewise, questions are not independent of one another. For example, question 3, suggesting simplification of a part, may involve use of a vendor's standard as suggested by question 6.

Requires Persistent Questioning

The analysis at this stage is simply persistent digging for results—considering every possibility — talking with Engineering, Manufacturing, associates in Purchasing, and Sales—contacting suppliers—negotiating with specialized contractors—speculating—and questioning.

When the analyst has completed this phase of the project he must apply good judgment in sifting the various ideas for each part and in deciding those that offer real possibilities for improvement. These are presented in a brief status summary listing: complete identification, sketch, present and proposed costs (often several proposals are listed), suggestions for reaching proposed costs, and space for entering data such as: actual results obtained, effective date of changes, and reasons for refusal to adopt suggestions. These items are usually not new to the engineer, the manufacturing man, or the buyer, for they have been working with the analyst—but the summary does bring the attention of each to unfinished items in his category.

A summary is made for each individual part on which improvement in value is possible, and parts which already represent value are also listed. Thus, at the end of the study, the value analyst reports on every item in the apparatus.

In these reports *anticipated yearly savings* are not shown. Value analysts indicate only per piece or per lot-size savings. The operating department that adopts the Value Analysis suggestion and follows through on it reports to management the *actual yearly savings* that were realized. This practice is another important factor in maintaining the good relations and co-operative spirit that is absolutely essential to the success of the Value Analysis Program.

Value Analysis Aids New Product Design

THE USE by the design engineer of Value Analysis techniques and services is well understood by all. It will be worth-while, however, to review the contribution being made by the drafting organization.

Elimination and *simplification* are two of the basic principles of Value Analysis. These apply to the design of new products equally as well as to the analysis of existing apparatus. Further, although it is essential to examine products periodically to take advantage of the latest developments for low-cost production, it is likewise essential to apply these new ideas to products presently on the board.

One who can do this successfully is the individual draftsman. Supervision may generate ideas, suggest, plan—but the man on the board is the one who actually puts the plan into action. To effect real savings in design, therefore, Value Analysis must also be beamed directly to the draftsmen.

Best for this purpose is a planned program that utilizes every medium to stimulate the cost-consciousness of draftsmen and to enlist their support in searching every drawing for every possible saving. Flyers, posters, group meetings, and reading matter all are used.

The program is a continuing one to provide the benefits of constant emphasis and repetition. Information is furnished in small, easy-to-take doses. And above all, the program is a draftsman's program,

with participation and contributions by draftsmen encouraged.

Draftsmen are sold on the Value Analysis objective — equivalent quality at lower cost—and are sold, too, on pertinent Value Analysis procedures, such as: elimination, simplification, use of standard parts, survey of materials and processes. They are given useful ideas and factual data.

In turn, they generate ideas and contribute to the program. When they do, their suggestions are rewarded. In this way, an additional incentive is provided over and above natural enthusiasm the program is bound to create.

Factual data provided for guidance in designing for low cost include checklists stating the points to consider in castings, moldings, punchings, formed parts, and so on. In addition, up-to-date figures on the cost per unit of weight, volume, and strength of commonly used materials is provided by the Value Analysis Division of the purchasing department.

The program pays its cost many times over. A properly informed, alert draftsman can save his weight in gold. Today more than ever before the challenge to modern industry is to produce more with less effort. Drafting is meeting this challenge—and one of its most powerful weapons is Value Analysis.

What Specific Questions Are Asked?

VALUE ANALYSIS is a way of thinking, a way of acting. Its basic philosophy is, "There is a better way to obtain equivalent quality at lower cost, only it has not as yet been found." Each of the ten basic measures of value suggests innumerable possibilities that may improve the product. A partial list follows:

Note the Function of the Part

Try to do the following:

1. *Eliminate the part:* (a) Change another part to perform the function. (b) Check accessory items and features—possibly the need for them no longer exists.

2. *Simplify the part:* (a) Put all tapped holes into one part—eliminate them from others. (b) Use available fastening devices and eliminate tapping entirely. (c) Challenge requirements that mean secondary operations, such as spring end grinding. (d) Make parts straight instead of curved—straight fittings cost less than elbows. (e) Use self-flaring fittings to eliminate operations and parts. (f) Don't plate copper parts which are later painted. (g) When blind holes are needed, show minimum depth with notation, "Don't Drill Through," rather than specifying depth limits. (h) Use squared ends —ground ends double the cost of the spring. (i) Don't knurl a rod that is pressed into a hardened hole. (j) Instead of two tapped holes for setscrews at 90°—put setscrews one on top of the other in the same hole.

Consider Materials and Processes

Check the following possibilities:

1. *Lower cost material:* (a) Use music wire instead of spring steel only when excessive loading demands it. (b) There are many tempers of copper and many types of bronze. Remember that half the weight of copper will carry the same current as equivalent bronze. (c) Remember also that ½ to ¼ the weight of spring brass carries equivalent current to phosphor bronze and the price per pound is also less. (d) Use lithographed in-

What Are the Qualifications for a Value Analyst?

I. REQUIRED QUALIFICATIONS

1. **A thorough understanding of materials together with experience applying materials.**
2. **Creative imagination along mechanical lines.**
3. **Engineering experience.**
4. **A basic appreciation of the importance of value.**
5. **A desire to work with others and a general knowledge of how to accomplish it successfully.**

II. DESIRABLE QUALIFICATIONS

1. **A general knowledge of vendors and methods for receiving valuable assistance from them.**
2. **Planning department experience.**
3. **Apprentice training.**
4. **Factory engineering experience.**

Added to these is the need for a man with an aggressive, inquiring mind. He must not accept customary solutions. He must be alert to new ideas and ever anxious to explore the possibilities of a new process. He must not be discouraged by opposition and the unwillingness of some suppliers to try out suggestions. He must be persistent.

When Projects Are Stalled, Try These Suggestions

1. Select a well-qualified vendor—get new information and a new idea from him. Put the problem up to him and press him to produce.

2. Break the problem down into two or three specific but smaller problems and assign each to a qualified specialized vendor for solution.

3. Talk it over with the project engineer again. Jointly agree that a hypothetical 20% of the cost must be removed and study with him how to start.

4. Talk about it to a man in one of the laboratories, someone in manufacturing, one in Standards. Tell them the problem—get some ideas from them.

5. As the part is studied—imagine that you are forbidden to use it. How then would the job be done?

6. Make a quick list of a dozen or a hundred suggestions—no matter how impractical some of them seem—then study the list.

7. Mentally review all new processes and products in trade magazines for applicability.

8. Determine how similar jobs are done by others—within and outside the company.

9. Find in the company a proponent of the idea and foster it through him.

10. Don't accept first effort—challenge further endeavor. Value Analysis only begins after the answer is "no."

11. If it is big enough, talk it over with the boss. He will probably have some good ideas.

stead of etched nameplates. (e) Use Terratex instead of mica for high-temperature, low-voltage applications. (f) Buy an aluminum or other disc instead of sheet or strip stock. (g) Use more magnesium extrusions. Magnesium tubing is lower in cost foot for foot than either aluminum or copper. (h) Don't use drill rod if steel rod will do the job.

2. *Higher-cost material:* At times, a more expensive material, by its nature and properties, will afford a simplified part and lower-cost assembly.

3. *Unusual but available raw materials:* (a) preplated steel; (b) expanded metal; (c) embossed metal; (d) rubberclad metal; (e) fiberclad or metalclad metals.

4. *Other methods of fabrication:* (a) diecasting; (b) extrusion; (c) permanent mold casting; (d) lost-wax casting; (e) miniature casting; (f) electro-forming; (g) powder metallurgy; (h) fabrication from copper or brass tubing; (i) low-cost, low-quantity stampings; (j) miniature casting on wire, cord, tape, or rod; (k) miniature casting automatically with inserts.

Check Manufacturing Methods

For parts:

1. *Alter the part so a high-speed method can be used:* (a) Perhaps it can go on a header or upsetter. (b) Make it of round or flattened wire on a wire-forming machine rather than a complicated terminal. (c) Strike the slot in the screw instead of sawing it. (d) Design parts for die-cast threads. A small flat in the parting line eliminates flash difficulty. (e) Drill and tap small parts in the strip before cutting apart. (f) When cross-drilled screws or bolts are needed, design so random drilling is permissible. (g) Make irregularly shaped parts of assembled laminations thin enough for stamping to avoid costly machining jobs.

For assemblies:

1. *Alter for automatic assembly:* (a) Don't use a complicated terminal when simple flattened wire applied by an automatic stapler would do as well. (b) To eliminate much adjusting labor, use prefired beryllium copper instead of phosphor bronze. (c) Don't have springs pressing against all of the assembly parts. (d) Don't assemble concealed parts between plates. Make up some subassemblies which are made openly and snapped together.

Seek Vendor's Standards

Alter so standards may be used:

1. Nails, washers, eyelets, spacers, bushings, similar parts
2. Classes of material supplied by specialty vendors as their standard: terminal boards, contact blades, spacers, similar units.

Select the Right Supplier

1. *Survey the purchasing with the buyer:* (a) Are the available highly specialized, low-cost suppliers being used? (b) Have the suppliers' engineers been given sufficient facts and pressed for suggestions which would produce equivalent performance at lower cost? (c) Has the buyer taken advantage of the know-how of other purchasing units using larger quantities of similar material? (d) Should some minor changes suggested by the supplier which afford lower cost material, be considered further? (e) Has the buyer found the basic source—the manufacturer who may be in a position to extend minimum prices?

2. *Miscellaneous:* (a) Use a good sampling method instead of 100% inspection. (b) Make an entire subassembly smaller, reducing amounts of material accordingly. (c) When buying adjacent parts from a vendor, have them preassembled if practicable. (d) Don't spend money for sizing if supplementary operations are necessary anyhow. (e) Make as many parts as practicable on a particular job of identical raw material.

ROUND TABLE

Hot Potato

"Ed, you look like you were just back—instead of just going—on vacation. If I was on my way this week end, I'd have a grin a yard wide."

"You'd wipe off the grin if you'd just caught what I did, Al—a real 'hot potato,' with the Old Man himself pushing it. He wants this job out right and in a hurry, says there's more business there if we can lick this one. Reminded me we could use the work and asked me to watch it myself and to put my best men on it."

"Can't you start it before you go, and pick it up when you get back? You've got two good men—Benson and Jenkins—to handle it. You've been bringing them along as potential foremen—here's their chance to show what they can do."

"It's easy to say all that, Al, but you know as well as I do that if I walk out on the job the Old Man will throw a fit. He'll think I'm getting too big for my britches. What's more, Benson goes on vacation when I do, and Jenkins when we get back."

"Listen, Ed, not so many years ago, the only vacations they got were ones they didn't get paid for. The company pays 'em for vacations, so should have something to say about when they take 'em. When the company is in a tight spot, they should be willing to change."

"Don't be silly, Al! They figure they've earned their vacations by working all year; they've pitched in on all the tough jobs that came along, and now they've got plans made. If I try to push 'em around, they may not quit, but they'll never forget it."

"Why don't you talk it over with 'em? Maybe they'll split their vacations—or take vacation pay on top of their regular pay and keep right on working."

"Not those two. The extra money won't mean anything to either of 'em—and how are you gonna split a fishing trip up north? The season closes a month from now."

"So you're going fishing, too, Ed? Are you really worrying about the boys—or yourself?"

"I'm thinkin' about myself, too, Al. We've got a place rented, and I want to get away—and far away—for a couple of weeks. This split vacation business is no good—no real rest, and I'm gettin' old enough that I need the rest."

"So you admit you're losing your bounce, eh? You get a hot job for the hot months, one the Old Man depends on you to do, and you'd rather go fishing! And the same goes for Benson and Jenkins. You'd think they just came to work."

"Nuts, Al! I've got all the bounce, as you call it, and loyalty I ever had, and so have the other two. But I'm selling my brains and experience, not my whole life. I'll bet the Old Man wouldn't miss his vacation over it. Last winter——"

"He had you to depend on, Ed. If you'd arranged your schedule right——"

"But I did! I gave the senior men first choice, I set it up so it staggered vacations through the hot weather—and now this lousy break!"

WHAT CAN ED DO? *How can he meet company needs and still not make his top men dissatisfied? How about split vacations or postponements? Your ideas on this problem will help others. Discussions of earlier topics appear on later pages.*

FIGURE THE OVERHEAD... DON'T GUESS

The difference between profit and loss on any item may well lie in the correct application and distribution of overhead

BY RUDOLPH A. SALZER
Consulting Engineer

IMPORTANCE of the correct application of overhead is not sufficiently appreciated, although it substantially influences the success of any business, and the adequate return on invested capital.

The best design, the best organized production methods, the most skilled labor, and the latest machine tools may not show a profit if the basis of cost calculation is incorrect. If this basis is not properly established, then the profit or loss on the manufacture of certain articles may be hidden, and at the end of the fiscal year only an average profit or loss can be obtained.

The amount of overhead is the sum of all unproductive expenditures for one year, which, together with material and direct labor, give the cost of the product for one year. As the cost of each single article must be determined, it is necessary to find the relation between productive and unproductive expenditures. All expenditures relating to production must be figured from the moment the raw material enters the plant to the time the finished product is ready for delivery. All other expenditures, such as sales, general management, taxes and profits are considered separate from production expenditures.

Overhead is usually added to: a) productive labor; b) machinery; c) material. It makes no difference if the product is electric current, nylon hosiery, or machines.

General Overhead

It is usual to speak of productive labor and unproductive expenditures. All labor is productive, if its work is to lay out, improve, finish or produce an object until it is ready for sale; for instance, casting cleaners, machinists, and assemblymen are all changing and improving the product until it is completed. These are productive expenditures. All other expenditures are called unproductive. This designation is misleading, although generally used. For instance, the designer who makes drawings for the product, and the shop superintendent who organizes and supervises the work, would be classified as unproductive workers, although without them production would not be possible.

Similarly, the men who clean the shop, the inspector responsible for the quality of the product, the foreman who directs, watches and supervises production, and many others, would then have to be called unproductive. Among these would also be listed the maintenance crew, shipping and receiving personnel handling the finished product, truckers and crane men, watchman, gateman, toolmakers, and toolcrib attendants, all to be figured in the general overhead.

Offices, also chargeable to unproductive expenditures, are: works management, engineering department, purchasing department, (if its costs are not charged to material overhead) and expenditures for annual building maintenance, plus amortization and capital interest. Administration, welfare, (except for the sales department), fuel, maintenance, materials, small tools, shop and electrical supplies, insurance and contributions toward pensions and sick-funds should not be forgotten.

Annual building maintenance is, of course, a variable expenditure. Capital interest and amortization are not variable, but must be included in the annual expenditures.

The general overhead, therefore, comprises everything directly or indirectly connected with production.

General overhead, therefore, comprises everything directly or indirectly connected with production.

The following example shows the connection between productive and unproductive expenses: A factory employs 250 productive workers and 80 unproductive workers; the average hourly wage for the former is $1.70; and for the latter, $1.15. There are 2000 working hours per year, therefore the sum of the productive wages is $850,000. The sum of the unproductive wages is $184,000, and all other unproductive expenditures are $930,000. The sum of these two is $1,114,000; or $1.00 production cost must carry a load of about $1.30 or 130%. If a certain operation requires 860 hours, it represents in wages $1,462. To this must be added 130%, so the true cost of the operation is $3,362.60.

Machine Constants

Machine tools are necessary for production in most cases. They are bought and considered an investment which should be paid off after a certain time, by production.

A heavy planer bought for $45,000 will be used only about 1000 hr a yr. This expenditure should be amortized within 10 yr, with the invested capital at 4% interest.

The cost of the machine is increased by freight charges, foundation cost, erection, and test run. All these together amount to $2,500; therefore the total expense for this machine comes to $47,500.

Capital interest for 10 yr on this investment is $9,500, or for one year $950. Amortization for 1 yr is $4,750, and electric current for 1 yr is $600. These three figures give the annual expense of $6,300, and because the machine is only

in use for 1000 hr, the cost per hr of use is $6.30.

The customary expression "machine overhead" is not correct, because it is a steady figure of $6.30, as shown above, and is independent of any wage change. It is preferable, therefore, to call it a constant, because the cost is time in hours multiplied by $6.30. It is advisable to have the constant figured to only one decimal place.

Use of the planer, or any machine, should be figured from the time setup is started and not from actual cutting time.

Material Overhead

For the sake of correct calculation of material there should be added to the supplier's bill, freight and cartage to the factory door. The other annual expenditures, relating to material, constitute the overhead, just as on labor.

All expenditures for purchasing and handling materials, until they are taken over for production purposes, belong to material overhead. These include all labor involved in receiving, registering, cutting, cleaning and transporting. Also figured into this overhead should be the stockroom and it's personnel, the purchasing department, the clerks who keep track of the materials, and others.

Many companies include stockroom and purchasing department expenditures in the general overhead. This is not really correct, but is permissible for small business. Amortization of stockroom equipment also should be included.

Cutting material before production should not be considered as a productive operation, because it is already included in the annual expenditures of the stockroom.

Figuring the Cost

Accompanying tables show by examples how the cost for a machined shaft, and a machined cast-iron piece, should be calculated.

The constant for small drill-presses or other machines costing less than $1000, can be omitted, or fixed at 10c. Depreciation and capital interest on these is so small that it is not important enough to be considered.

Thus far, the development of overhead for small and medium concerns has been explained. This is not complicated. It will, however, be quite different if a power plant, pattern shop, foundry, metallurgical laboratory or other departments are parts of the plant. The building up of overhead will be somewhat different and will require individual study.

Frequently only one overhead is figured, and applied to the production costs. Machine and material overhead are all included in this. This scheme is tolerable only if small machine tools and light movable material is in use. Another possibility for one overhead is the production of only one article.

The foregoing indicates the correct way to figure overhead, but it is well to bear in mind some common, but incorrect practices. It is definitely incorrect, 1) to guess at the overhead; 2) to figure the product based on this guess; 3) to compare the result with a competitor's price and then adjust by reducing it a percentage.

It is a misconception to figure the general overhead partially on the machine tools for work done on those machines, and then to add the wages onto the machine figure.

The mechanics working on the bench or the erecting floor, and all others who do not use machine tools would then have a separate fixed overhead, for instance, $1.50. With this type of figuring it is impossible to analyze the cost and to arrive at an accurate result.

Supposing wages increase, this will not show up fully in the cost figures, because only the difference between the two wage figures will be accounted for, although unproductive costs are also higher, and these do not show up at all. This would also occur if a slump in production should bring the big machines to a standstill. In this case the whole cost system would be out of balance, as one of the leading factors would be eliminated.

It is extremely important to calculate overhead, to ascertain the true price of the product and to compete safely with other companies.

COST CHART FOR CAST-IRON PIECE

MATERIAL OVERHEAD 15%
MATERIAL COST $74

GENERAL OVERHEAD 130%
MATERIAL COST PLUS OVERHEAD $85.10

Operation	Mach No.	Machine Constant $	Mach Hr	Cost of Mach Time $	Labor Hr	Labor per Hr $	Labor Cost $	Labor and Overhead $	Cost of Operation $
Cleaning*					1.8	1.45	2.61	6.00	6.00
Layout					2.8	1.55	4.34	9.98	9.98
Planing**	16	1.90	6.1	11.59	4.2	1.60	6.72	15.46	27.05
Boring	5	.80	2.9	2.32	2.9	1.60	4.64	10.67	12.99
Drilling	11	1.10	2.1	2.31	2.1	1.55	3.25	7.47	9.78
Cleaning					1.3	1.35	1.75	4.02	4.02
							Cost of finished part		$154.92

*Sandblasting is not considered as a machining operation, as the compressed air is used all around the shop and its cost is included in the general overhead.
**Worked on two machines.

COST CHART FOR STEEL SHAFT

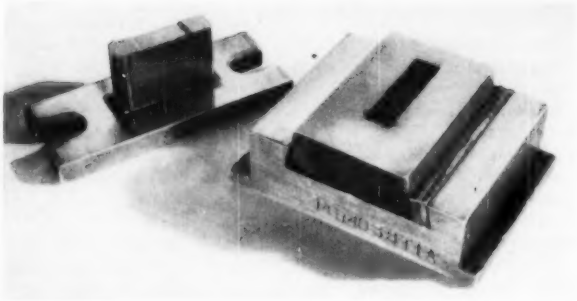
MATERIAL OVERHEAD 15%
MATERIAL COST $65

GENERAL OVERHEAD 130%
MATERIAL COST PLUS OVERHEAD $74.75

Operation	Mach No.	Machine Constant $	Mach Hr	Cost of Mach Time $	Labor Hr	Labor per Hr $	Labor Cost $	Labor and Overhead $	Cost of Operation $
Layout					1.6	1.55	2.48	5.70	5.70
Rough Turn*	68	0.40	8.6	3.44	5.4	1.65	8.91	20.49	23.93
Finish	74	0.25	7.0	1.75	7.0	1.70	11.90	27.37	29.12
Grind	82	0.25	3.6	.90	3.6	1.70	6.12	14.08	14.98
							Cost of finished shaft		$148.48

*Worked on two machines.

LIFE TESTS HELP TO CHOOSE DIE MATERIALS



BY J. R. TAYLOR, Tools Supervisor, Feeder Division
and
A. T. HAMILL, Metallurgical Engineer, Materials Engineering Department
WESTINGHOUSE ELECTRIC CORPORATION

Undercut portion in center of punch distorts scrap as it is cut from the lamination, so scrap will not be withdrawn from die on return stroke. Cutting members of this die are made of tool steel

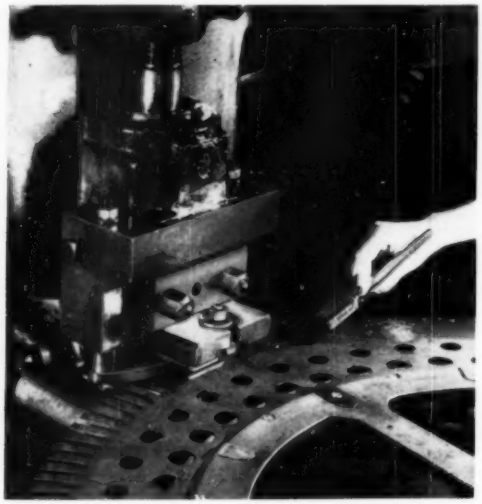
ELECTRICAL design engineers continually demand higher quality, lower cost, more burr-free steel laminations from their punch-press departments. The result is a continual search for die materials that will cut silicon-steel lamination stock without rapid wear.

Tool materials available to the lamination die maker can be divided into three classes:

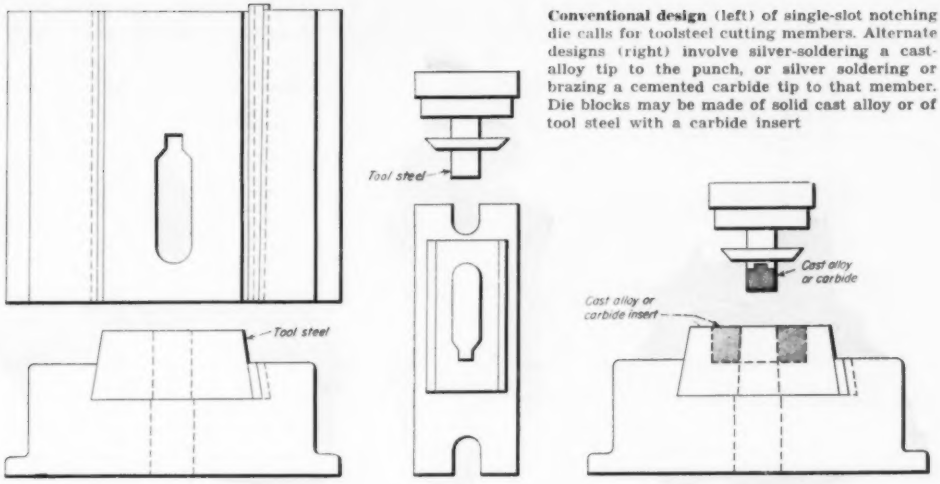
1. Tool steels.
2. Cast refractory alloys.
3. Cemented tungsten carbides.

The tool steels commonly used for lamination dies show wear, and consequently burred punchings, after a relatively small number of operations. Therefore, the dies must be reground frequently. This is expensive when the time required for die setup, machine downtime, die loss due to grinding and cost of the grinding operation are considered.

Tool steels generally used at Westinghouse for making lamination dies are high-speed steel and high-carbon, high-chromium die steel. These steels have the advantage of being relatively easy to fabricate. They can be machined, drilled, tapped and ground with a minimum of difficulty in the modern, well-equipped toolroom. Yet the trend, where economically justified, has been to sacrifice ease of fabrication by using cast nonferrous refractory alloys or cemented tungsten carbides for making dies in order to gain their



Automatic indexing notching presses are widely used for cutting coil slots in laminations for electric motors and generators, where production quantities are not large enough to justify expensive compound or progressive dies. Relatively low cost of dies for these presses permits economic testing of various punch and die materials.



Conventional design (left) of single-slot notching die calls for toolsteel cutting members. Alternate designs (right) involve silver-soldering a cast-alloy tip to the punch, or silver soldering or brazing a cemented carbide tip to that member. Die blocks may be made of solid cast alloy or of tool steel with a carbide insert

Expected Slot-Die Life For Various Tool Materials

Single-Slot Notching Dies Punching Medium Silicon Steel

Tool Material	Average Expected Cuts per Grind
High-Speed and High-Carbon High-Chromium Steel	50,000-100,000
Cast Alloy-Comp. No. 1	200,000-700,000
Cast Alloy-Comp. No. 8	125,000-250,000
Cemented Carbide	500,000-700,000

superior wear-resisting qualities.

Laboratory investigations were prompted by successful application of a cast-alloy of the cobalt-chromium-tungsten type to a single-slot notching die. Several cast-alloy compositions and some cemented carbides were tested for suitability in long-life lamination dies. Typical compositions and properties of the various cast alloys investigated are tabulated.

Principal matters covered in experiments were the effects of section size and method of casting (chill or refractory mold) upon hardness and microstructure:

The effect of casting method upon edge toughness of die materials was evaluated from a test originally developed to check results of various heat-treatments upon high-speed steel. In this test, a small mallet is struck against a 45° knife edge by means of a weighted pendulum. The force in inch-ounces required to fracture the knife edge is recorded. From test results, compositions No. 3 and No. 8 appear to have appreciably higher edge toughness values, a desirable property in blanking die materials.

During the past three years, Westinghouse tool and production engineers also have carried out die-life comparison tests on single-slot notching dies made of tool steel, cast alloys and cemented car-

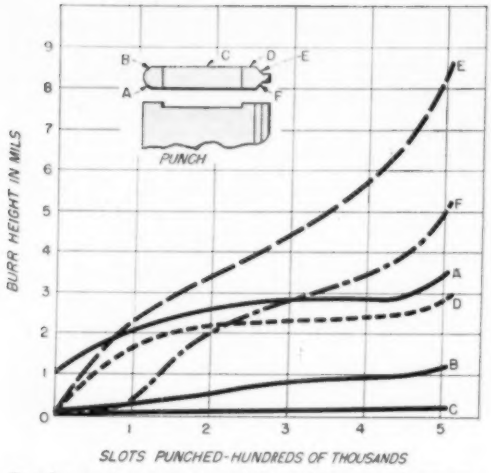
APPROXIMATE COMPOSITION OF CAST ALLOYS TESTED

Composition Number	C	Cr	W	Co	V	Ta	B	Mn	Mo	Fe
1	2.3	27	16	45	——	4	0.5	2	——	——
2	2.2	15	21	40	——	19	0.2	——	——	——
3	?	27-31	16-19	35	(Balance — 18% other elements)					
4	2.25	33	17	44	——	——	——	——	——	2
5	0.6-0.8	5	8	20	1-3	——	0.5-0.8	——	5-8	Bal.
6	1-2	36	20	40	——	——	1-2	——	——	——
7	——	9	——	——	——	——	1-2	——	14	Bal.
8	——	10	15	——	——	——	3	——	——	Bal.

HARDNESS (ROCKWELL C) OF CAST ALLOYS TESTED

Composition Number	½ sq x 3" Chill Cast	½ sq x 3" Ref. Mold*	⅝ x 1⅛ x 2" Chill Cast	⅝ x 1⅛ x 2" Ref. Mold	1 sq x 3" Chill Cast	1 sq x 3" Ref. Mold
1	63-65	60-61	61-62	58	——	56-58
2	65-67	64-66	64-65	62-63	——	58-59
3	62-63	——	60-61	——	61-62	——
4	62-64	——	60-62	——	61-63	——
5	71	——	69-70	——	69-70	——
6	65-67	——	63	——	61-62	——
7	——	62-64	——	63-64	——	54-56
8	63-64	62-63.5	67	62-63	63	58-59

*Refractory mold



Punch wear is uneven around the periphery, as shown by records of burr height per 100,000 pcs. The least wear occurs on the flat sides of the punch

EDGE TOUGHNESS OF CAST ALLOYS TESTED

Composition Number	Method of Casting	Edge Toughness (in oz.)	Hardness (Rc)
1	Chill	4.08	61–62
1	Refractory	4.08	58
2	Chill	4.08	64–65
2	Refractory	14.25	62–63
3	Chill	18.3	60–61
3	Chill	10.2	61
4	Chill	7.15	60–61
4	Chill	4.08	62
5	Chill	4.08	69–70
6	Chill	4.08	63
7	Refractory	10.2	63–64
8	Chill	4.08	67
8	Refractory	339.0	62–63

bides. Excellent results have been obtained when using both cast alloys and the tungsten carbides. An accompanying table gives the average number of cuts per grind which can be expected from notching dies made with these materials.

Single-slot notching dies for automatic indexing presses are used for making rotor and stator laminations when the activity in number of pieces needed per year is not high enough to justify compound or progressive blanking dies. Resistance to wear and edge chipping is just as important with these tools as with compound or progressive blanking dies.

How Inserts Are Used

Construction of a single-slot notching die is sketched. To make cutting members from cast alloy instead of tool steel, the only design change necessary is in the punch construction. The die pieces are made and assembled in the usual manner, and an insert for the punch is brazed to an alloy-steel backup piece. The assembled punch is mounted in the punch plate by usual methods. Cast-alloy dies made in this manner cost approximately 1.7 to 2.3 times that of a tool-steel die.

When it is desired to make the cutting members from tungsten carbide, inserts instead of solid pieces are used for both die and punch. Again, the inserts are brazed to alloy steel backup members. Dies made in this manner cost approximately three times as much as a tool-steel die.

Relationship of burr height to number of die operations for a single-slot notching die was established by measurements with an optical device known as the "Burrscope." The most significant feature of the data presented is the unusually small burr which resulted on the flat side of the punch (region C in chart)—less than 0.001 in. after 513,000 operations. Visual examination of the punch and die in this region showed no perceptible wear, while the other parts of the cutting edge chipped.

An acceptable explanation for this result is that the first part of the punch to enter the die absorbs the shock of misalignment, regardless of cause, and then serves as a guide for the undercut part of the punch. The undercut, or "shear" at the center of the punch is for the purpose of distorting the scrap so it will not be withdrawn from the die and create a possibility of hazardous double-cutting.

Based on experience to date, from 200,000 to 700,000 slots per grind may be expected from a single-slot notching die made from the alloy composition No. 1. Criterion is a maximum burr height at the end of the run of about 5 mils (0.005 in.). This refers to single-slot notching of medium-silicon, electrical sheet steel.

Life of Cast Alloys

Tests have also been run with cast-alloy compositions No. 3 and No. 8. Composition No. 8 performed two to three times better than tool steel, averaging about 200,000 operations per grind. Composition No. 3 exhibited poor life, the cutting edges failing rapidly because of minute chipping. The cause for this was not determined.

Use of single-slot notching dies with tungsten carbide inserts has been discontinued, because of the inherent danger of the punch striking the cutting edge. It is preferred to apply the tougher cast alloys for such work, until press and or die redesign provides better guiding of the punch.

Several compound blanking dies with all cutting members made from cemented tungsten carbide have proved successful at Westinghouse. With these dies it is possible to insure proper guiding of the punches with little chance for misalignment.

KOVAR BLOCKS BACK UP CARBIDE DRAWING DIES

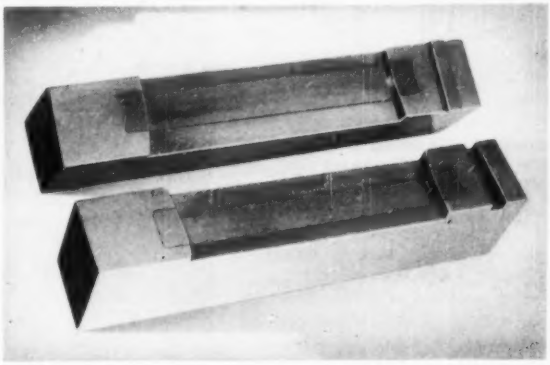
BY H. C. AMTSBERG, Materials Engineering, WESTINGHOUSE ELECTRIC CORP.

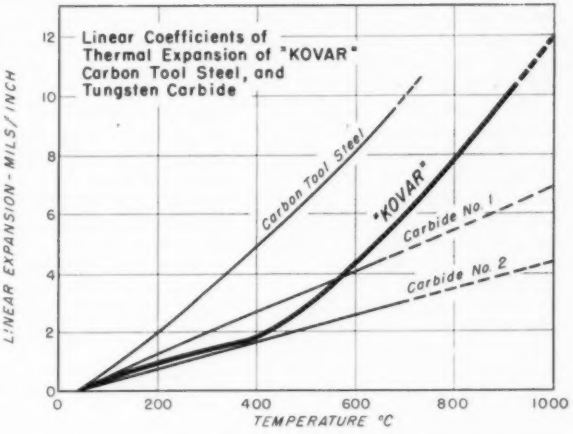
KOVAR is a nickel-iron-cobalt alloy developed for making glass-to-metal hermetic seals. Its thermal coefficient of expansion closely matches that of hard glass, and is also similar to that for tungsten carbide up to about 850F. This feature of the material has been employed in an extra application that may, like many an extra added attraction, prove as important as the primary use.

Copper bar and strap is drawn with carbide die sections, which are normally set in steel holders. But steel's expansion rate does not nearly match that for carbide, and the brazing process, which joins the carbide insert to the steel block, frequently causes strain cracking in the carbide. Such cracked assemblies, naturally, are a complete waste of time and material.

Even at the brazing temperature of 1300 to 1450F, Kovar's coefficient is much closer to carbide's than steel's, so strain is much less. Die-making techniques are the same: the Kovar backup block, like the steel block, is drilled and end milled to a slot for the carbide insert, the flux and brazing alloy are applied, and the assembly is heated in a furnace. After the joint is finished, the die is ground to the desired shape and dimensions.

The alloy has about the same physical properties as SAE 1010, and is easily machined. It does not undergo the objectionable dilation that accompanies the gamma-alpha transformation in steel. Kovar-and-carbide draw dies like those illustrated are suitable for drawing copper stock up to 6 in. wide.





What Is a Slow-Helix?

The agreement of Britain, Canada and ourselves on the unified screw thread is a big step forward in many ways, especially to those of us who remember when bolts and nuts made by different concerns were not at all likely to go together. One large maker even made his ¼-in. bolts 1/32 in. large because he felt that ¼ in. was too small, but he called them ¼-in. bolts just the same.

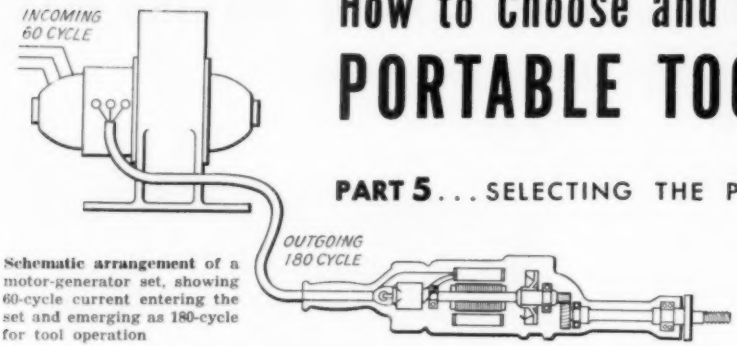
But when it comes to the terms "spiral" and "helix," we are still all at sea. For in the same issue of the *American Machinist* we find one maker of cutters telling about his "Fast-Spiral" and another about his "High-Helix," which look near enough alike to be twins. But to make things more confusing, still another maker shows a similar cutter and calls it a "Slow-Helix." What is a poor guy without a college education to think?

Most of us think of a helix as a screw thread and of a *fast* thread as one which advances rapidly in a nut. So the man in the shop would call the so-called slow-helix, a fast-helix, and so add to the general confusion.

Now some are calling what we formerly called the helix angle of a screw thread the "lead angle," which may be better because the helix angle is described as "the angle made by the pitch helix with a plane perpendicular to the axis." But in helical gears the helix angle is the angle made by the pitch helix *with* the axis.

This confusion of terms must add to the difficulty of doing business with foreign countries and cause errors in ordering tools or gears or screws, especially where accuracy is required. If the engineers of three countries can get together on a unified screw thread, the manufacturers of this country should be able to agree on the names of things they make. And while the main point is to have the names *uniform*, it is even better to have them *correct* according to standardized engineering terms.

F. H. COLVIN



Schematic arrangement of a motor-generator set, showing 60-cycle current entering the set and emerging as 180-cycle for tool operation

How to Choose and Use PORTABLE TOOLS

PART 5 . . . SELECTING THE POWER SUPPLY

BY H. P. BAILEY, President, THE ROTOR TOOL CO.

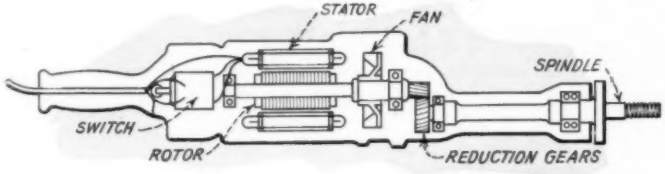
THE PROBLEM of selecting the type of power for portable tools requires careful evaluation of the costs of the installation, the operating power costs and the productivity of the different types of tools. Portable-tool equipment of all types, universal electric, air, 180-cycle and 360-cycle electric is in use in a large number of plants. The crux of the problem is to analyze the portable tool situation from the engineering standpoint, then to compare this analysis and fit it into the individual problems of a particular plant.

As tools of all four types are in daily operation, it is obvious that each type fills the needs of a large number of manufacturers. It is the purpose of this article to state without prejudice the general conclusions of factory executives of the merits and disadvantages of each of the four types. In view of the individual problems in individual plants, certainly no assumption is warranted that any one type of power supply is best, until all considerations have been checked in the light of a detailed analysis of the individual situation.

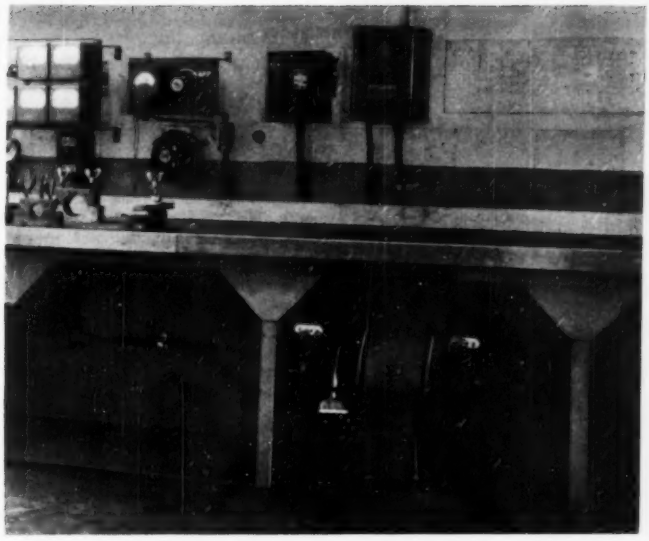
Universal electric tools are driven from the customary, installed electric system in the shop and require no special form of power supply. There are undoubtedly more universal electric tools in use than the other types. The power cost and purchase price are low, but it is generally recognized that the horsepower per pound is somewhat low in comparison with other types, and that the maintenance tends to be high. In the field of abrasive operations (grinding, sanding, etc.), the production output is generally regarded as somewhat lower than that with the other types of tools, but the simplicity and low first cost of the installation and the large number of types of tools available to select from, contribute much to their popularity.

Air tools require an air compressor to furnish power, plus a distribution system to convey it to the point of use. Factory executives well know that the cost of installation, and for power itself, for air tools is higher than for other types, but they recognize the advantages of air tools in the form of high horsepower per pound, easy handling, high maintained load speed and low maintenance costs. Furthermore, air is often needed for other operations, so the addition of air tools will require only a larger compressor.

In recent years, 180-cycle tools have become better known. These require a separate power-supply unit which converts the incoming electric current at the factory into 3-phase, 220-v, 180-cycle, through an induction converter or motor-generator. The tool motor is a squirrel-cage induction type in which the speed of the motor is governed by the frequency of the power supply, 180 cycles. The motor develops a rotor speed of 10,800 rpm when wound for two poles, and thus gives exceptional power per pound, as well as eliminating electrical connections between the stator and rotor, and troublesome commutators and brushes. This reduces the maintenance cost as compared with universal electric types. The field for 180-cycle tools is limited in practice to rotary tools, since they are not available or satisfactory for percussion work (hammers, rammers, etc.) nor is high-cycle current suitable for general shop use.



High-cycle tool, showing how current enters the tool, passes through the switch and flows through the stator only. There is no electrical connection between rotor and stator, and no brushes or commutator



Typical installation of a small motor-generator set for high-cycle tools located beneath a workbench immediately adjacent to the workplace

The horsepower per pound is lower than for air tools, but speed is well sustained under load, and 180-cycle tools are found in large numbers on automobile and agricultural implement assembly lines, as well as in smaller installations in medium-size plants.

The 360-cycle tools are similar to 180-cycle tools, but the frequency supplied by the induction converter or motor-generator is doubled to 360 cycles per sec, giving a rotor speed on the tool motor of 21,600 rpm. This is used direct for very small abrasive wheels, or is reduced to proper operating speeds by gears for larger abrasive tools, drills, screwdrivers, and nut setters. The horsepower per pound is higher than that of 180-cycle tools, and usually is equivalent to that of air tools. Speeds are well sustained under load. The major advantages of 360-cycle tools are light weight and high power compared to other types.

Universal Electric Tools

Universal tools operate either on 60-cycle, single-phase ac or on dc, usually 110 v, and do not require a separate power-supply unit. The power cost in the larger sizes, such as 6-in. grinders, runs up to 1½¢ per hr on the basis of 50% use factor. The power distribution system is simple, although the wiring should be calculated to carry the estimated load without excessive voltage drop, and the receptacles should be the proper type to insure delivery of adequate power to the tool. There are no particular difficulties involved in power distribution if reasonable care is taken to provide adequate-size conductors. If such precaution is not observed, performance is adversely affected. Particular care should be taken to see that tools are properly grounded to avoid accidents, especially in wet areas.

180-Cycle and 360-Cycle Tools

For brevity, these tools are treated as one type of tool, with comments on specific variations where warranted.

The following method of analysis is suggested to determine the size of motor-generator required for a typical group of 180-cycle tools: Let's assume these tools include 8 heavy-duty 6-in. grinders, 8 heavy-duty right-angle grinders suitable for 6-in. cup wheels or 9-in. sanding pads, 5 cone grinders and 4 small-wheel grinders. In arriving at the size of generator required to provide the 180-cycle current, calculations are based on the average load demand as shown in the accompanying table.

Assuming that not more than 60% of these tools are actually drawing current at one time, average demand will be 61.8 amp.

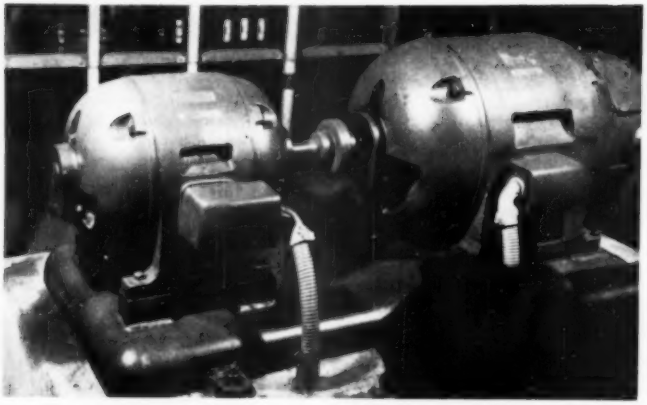
Rated output of a 20-kw high-cycle motor-generator set is 65.6 amp at 40C. Therefore, this set will be ample to take care of the load, and if the load factor should, for some reason, exceed 60% at certain periods, the set will withstand a reasonable overload for a limited time.

In the case of 360-cycle, the size of the power supply unit is figured in the same way. In general, the present design of 360-cycle tools provides the same power as the heavier types of 180-cycle tools but in a lighter weight. The current consumption, therefore, is about the same, although under overload conditions it may be more, so that a figure of ampere average loads increased by perhaps 10 to 20% gives a sounder basis for the consumption.

Consideration must be given in the case of the 180-cycle and 360-cycle to the basic problem of using a frequency changer or motor-generator type. A frequency changer is most commonly supplied, but careful engineering consideration must be given to the

TYPICAL LOAD DEMAND FOR PORTABLE TOOLS

8—6-in. grinders	at 5 amp average load =	40 amp
8—cup grinders or sanders	at 5 amp average load =	40 amp
5—cone ginders	at 3 amp average load =	15 amp
4—small-wheel grinders	at 2 amp average load =	8 amp
25 tools	Total	103 amp



Frequency converter set, made as a separate installation and rated at 20 kw, for supplying several tools

advantages of both types. The frequency changer is really a special wound-rotor, induction motor, driven as a generator by a squirrel-cage induction motor, or in the larger sizes by a synchronous motor. These are furnished in two- or four-bearing types and usually operate at 1800 rpm and insure voltage regulation of 8% maximum. A frequency converter is quite satisfactory for either 180- or 360-cycle where fluctuations in the incoming voltage are within the range of plus or minus 7½%. It is necessary, however, to determine the incoming voltage variation accurately, rather than simply taking the word of the power company, because at certain times in a day these variations may be quite significant, and will result in corresponding variations in the voltage delivered to the tools.

Choice between a motor-generator and a frequency converter for producing the high-cycle current is usually governed by these local power conditions. Where voltage variations are at all significant, a motor-generator is often used, which consists of a 180-cycle generator driven by a squirrel-cage induction motor, or synchronous motor for larger types, or by dc motor.

With a motor-generator the high-cycle voltage is independent of variations in the power-supply voltage and may be regulated manually or automatically to maintain the desired voltage at the tool. Also the power factor in the high-cycle tool is not transmitted to the power line. Motor-generator sets can be furnished with special windings and voltage regulation which will automatically maintain the high-cycle voltage within 2% of the desired amount between idle and full load.

In high-cycle installations, the question of centralized or decentralized power arises. A small unit can often be put up overhead, directly over the job and out of the way. If the high-cycle unit is installed to give extra capacity to an existing air installation, the unit is nearly always installed right in the department. However, centralized power-supply units are quite practical, provided the distribution lines do not run more than about 500 or 600 ft to avoid excessive voltage drop.

Determining Power Costs

Referring to the original example, the group of 25 180-cycle tools required a power supply of 103 amp at full use, and 61.8 amp at average demand, leading to the use of a 20-kw high-cycle motor-generator set. The power cost of providing this 61.8 amp is counted for practical purposes as follows: A 20-kw set is rated at 65.6 amp and requires 30 brake horsepower. Therefore, when delivering 61.8 amp, the set will require $\frac{61.8}{65.6} \times 30$ bhp = 28.2 bhp or 21.0 kw.

Allowing 80% motor efficiency means an input of 26.3 kw, which at 1½¢ per kwhr equals 39½¢ per hr to cover 25 tools, or an average of 1.6¢ per hr per tool.

It is interesting to note that the power cost of universal and 180- or 360-cycle tools is about the same. The losses in conversion in the 180- and 360-cycle are about made up by the higher efficiency of operation of the motor itself.

Remembering that, after all, the power cost of a portable tool is relatively unimportant in comparison to the labor cost, the power cost of universal, 180- and 360-cycle tools is about one-fourth that of air. The important element of the problem is the productivity of the tools themselves.

Productivity of High-Cycle Tools

Air tools and 360-cycle tools have about the same hp per lb, according to the manufacturers' literature, or about 1 hp for every 3 to 5 lb, followed by 180-cycle with 6 or 7 lb per hp, and universal with 10 to 15 lb per hp.

This means that the weights of the air- and 360-cycle tools are most favorable for production operations, with 180-cycle next, and universal the highest in weight. From the maintenance angle, 180- and 360-cycle tools are undoubtedly easier to repair than universal tools and probably, in the long run, require about the same amount of labor as air tools. The 360-cycle is still comparatively new and offers possibilities for increased production combined with light weight. This should not be ignored, particularly in laying out a new department or new plants, but it must be remembered that 360-cycle power tools are not available for the wide field of operations covered by air tools and universal electric tools. It must also be remembered that both 180- and 360-cycle tools maintain their original power until an absolute failure occurs. The power curve over the years is practically a flat, straight-line curve.

In considering any of these types of power tools, it is well to realize that maximum efficiency in the larger plants is often obtained by

using different types of power supply in different departments or operations. Factory problems are dynamic and changing, and conditions resulting from studies of this situation made in past years may well prove wrong, since there has been a great improvement in the variety and productivity of the different types of portable tools since the end of the war. New metals, better bearings, and more power are a few of the many features which give greater productivity and have substantially changed old relationships.

Fortunately, general policy in the portable tool field is for the manufacturers to supply tools for trial under actual shop conditions sufficient to determine the productivity of the particular tool.

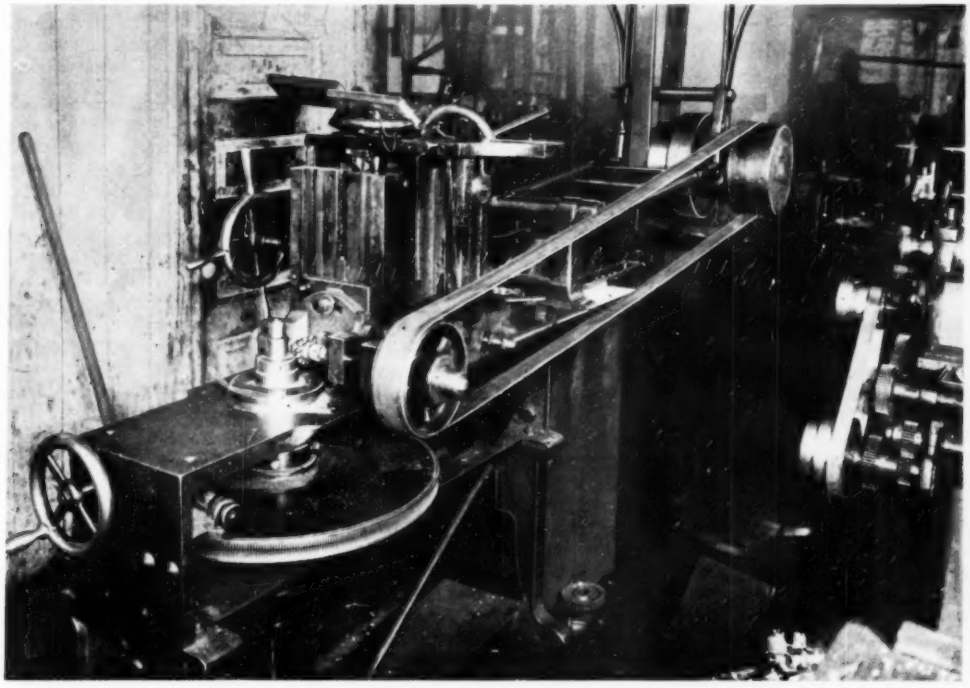
As savings made in selecting the right type of power supply will continue over the years, such studies will prove profitable, provided the results are tabulated and presented in final, complete form. With portable tool costs running a minimum of $2 per hr for labor and some part of the overhead, the possibilities of saving 20 to 50% through a thorough study of the power-supply situation are well worth investigating.

Under average conditions, the cost of operating electric tools, universal, 180- and 360-cycle, will be about:

Heavy-duty drill	¾¢ per hr
8-in. heavy-duty grinder	1½¢ per hr
¼-in. drill	½¢ per hr

These costs should be compared with the costs for air tools to be presented in the next article.

(Part 6 of this series will appear in a forthcoming issue—Ed.)



WHEN THEY CHEWED OUT GEARS WITH THEIR TEETH

BY FRED H. COLVIN, Editor Emeritus

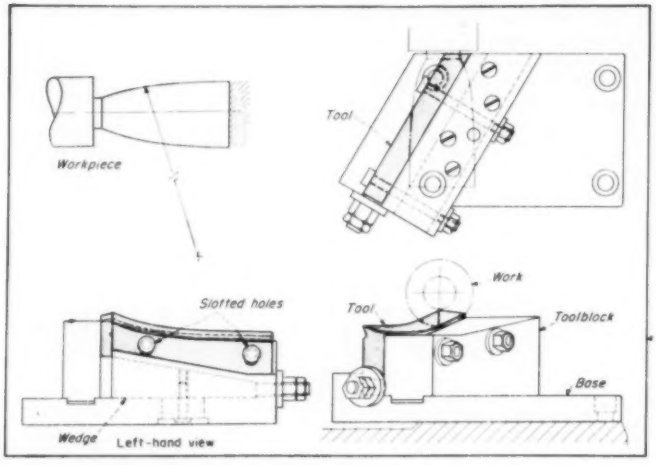
WOULD you know what to do with this machine if you were turned loose on it? It's a gear cutter, and it was used well over 75 years ago in an old New England shop. It was found, as I recall, in the George H. Corliss shop, the very same where the famous Corliss engine of the Centennial of 1876 was built.

The index plate was at the lower end of the work spindle, under the table, with the dividing or indexing worm meshing in the outer rim of the plate. The plate was an excellent catch-all for chips.

The cutter spindle had a large vertical movement on the slide, which also moved on the bed to accommodate large gears. The cone drive at the rear of the machine moved back and forth with the head, like a swing-grinding head for snagging castings in a foundry. A belt tightener was located between the sliding head and the cone.

You can get an idea of the feeding mechanisms of those days from the end of the old lathe at the right. The gears, which had to be changed for cutting various pitch threads, were driven by 1-in. belts.

Practical Ideas



Angled Forming Toolbit Slices Parts Without Chatter

AN EVER-PRESENT problem in machine shops is chatter caused by broad form tools. This trouble is often reduced or eliminated by increasing the number of roughing cuts, modifying the cutting angles, and machining with different speeds and feeds.

These methods are of doubtful value, especially because a good finish often depends upon a lucky combination of them. Instead of trying out combinations, we designed and built a special forming tool for cutting the radiused job illustrated above.

A base was machined and located on the rear toolslide of a turret lathe and a specially formed toolblock was bolted to the base. The block was mounted at an angle of 30° to the machine spindle and was tenoned to the base. A high-speed-steel cutting tool was bolted to the block through slotted holes in the block and on top of a sliding wedge. The slots and wedge let us raise and lower the tool after it was mounted and for fine height adjustment after regrinding.

In action the tool is advanced toward the work from the rear of the lathe until the right-hand edge of the cutting edge contacts the stock. As the tool advances farther the cut progresses from the right to the left, causing a shaving-like action that turns out a narrow, coiled chip with no chatter.

Results of turning with this tool were not only a smooth finish, but parts were turned out much faster than with conventional turning attachments. The design is recommended primarily for large-quantity lots or mass production, because manufacture of the tool is expensive unless the cost is spread over a large number of parts.

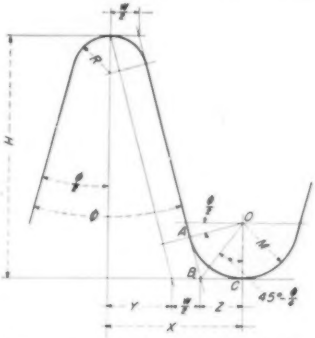
The correct shape for the tool was obtained in this manner: A dummy cutter was made to the correct profile for the part and was gashed, but not hardened. Then a lead block was mounted on a milling machine where the cutter was fixed in the arbor and a cut was taken over the lead block. Gages were filed to fit the lead block at the correct angle (30°) to fit the final tool, and the tool was made to conform to the gages.

While the process may sound complicated, its cost apportioned among the many parts produced was quite small. *J. A. Waller, Kent, England.*

Form-Tool Mathematics

THE ARTICLE by D. E. Sweet on constants for pulleys and form tools for cutting pulley outlines, which was improved by C. A. Johnson, can be simplified still more. The constant K equals tangent $(45° - \frac{\phi}{4})$. This value is not only simpler, but only a tangent table is required to find any value.

As in the original problem, the



dimensions R, M, and H, and the angle ø are known, and dimensions $\frac{W}{2}$ and X are to be found. In the drawing, angle AOC is bisected by the line OB, so angles AOB and BOC are equal to half of $90° - \frac{\phi}{2}$, or $45° - \frac{\phi}{4}$.

The required dimensions can be found in this manner:

$$\frac{W}{2} = R \text{ Tan } (45° - \frac{\phi}{4})$$

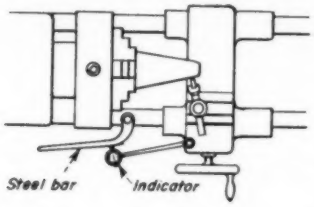
$$X = Y + \frac{W}{2} + Z$$

$$Y = H \text{ Tan } \frac{\phi}{2}$$

$$\frac{W}{2} = R \text{ Tan } (45° - \frac{\phi}{4})$$

$$Z = M \text{ Tan } (45° - \frac{\phi}{4})$$

Therefore, $X = H \text{ Tan } \frac{\phi}{2} + (R + M) (45° - \frac{\phi}{4})$. *A. Vetsch, Stefisburg Station, Switzerland.*

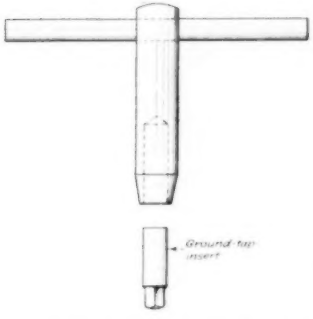


Quick Setup Produces Turned Tapers

HERE is a method for turning tapers on a lathe that was thought up in a new plant where a lot of equipment—including a taper attachment—was not available.

A square bar of steel — ½-in. section—was clamped to the front way of the lathe just ahead of the chuck, and was aligned at half the taper angle to the ways. This was done with a protractor. A dial indicator was mounted on a rod clamped to the cross-slide, and was positioned to touch the bar and read zero.

The cut is started with the feed-screw engaged, and the operator keeps the indicator reading zero by adjusting the cross-slide. After a few passes, this can be done quite accurately; and it can be done for both inside and outside tapers. *R. M. Alcorn, North Bay, Ontario.*

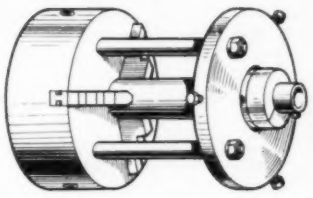


Broken or damaged chuck key can be repaired by drilling out the old key and replacing that part with a broken tap which has had the thread ground off and is ground to a square section on its end. The tap is welded into the original key shank, where it will serve for the rest of the life of the handle. *Lyle C. Vingar, Waukesha, Wis.*

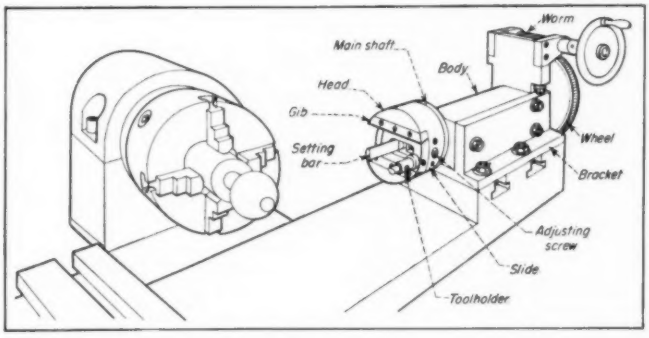
Rotating Steadyrest Supports Long Work

LONG TUBING that is too large in diameter to be chucked in a collet can be faced off, counterbored, and turned at the end by setting it up in an adapter of this kind.

A round plate about the diameter of the chuck is machined out in the center and screws are mounted so the plate can act as a steadyrest. It is then bolted to the chuck by means of long bolts through tubing spacers, or by long, threaded rods. These rods or spacers must be of equal length, and the plate must be mounted so it is on center.



Tubing to be worked is then chucked and clamped by the screws in the plate, trued to center, and machined. The work can be clamped directly by the screws in the plate, or it can be fitted with a split bushing, as illustrated. *N. H. Arrowsmith, Surrey, England.*



Sphere-Turner Features Quick Radius Adjustment

ACCURACY in sphere-turning is possible with this attachment made for a No. 7 Ward capstan (turret) lathe, and mounted on the rear platform of the cross-slide. This feature allows tools on the front of the slide to rough out the work.

One advantage of this device is that the tool can be set to the required radius with an inside micrometer or caliper before the cut is started. The main shaft of the tool, which is rotated by the worm and wheel, fits inside the body. This shaft is bored for a close fit around the setting bar—a round bar with its end cut off to the centerline for about a 2-in. length. The setting bar is aligned opposite the cutting tool; the tool is adjusted to the required radius by movement of the gibbed slide that supports the toolholder.

The wormwheel has 200 ⅛-in.-pitch teeth, and is made up of a bronze outer ring and a mild-steel hub. It is keyed to and locked against a shoulder on the main shaft. Three spring-loaded plungers in the wormwheel hub force against the body and take up backlash in the shaft.

An adjusting screw threaded into the head and a tapped hole in the slide provide slide movement with a 40 tpi ratio that approximates standard micrometer adjustment. The head is securely fastened to the large-diameter shoulder of the main shaft, and the complete assembly is mounted on the lathe slide by means of a bracket. *R. B. Wolverhampton, England.*

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JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

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79th Winner:

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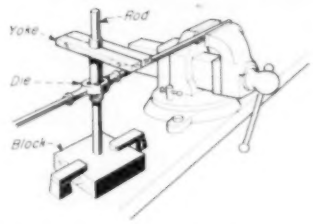


Bench Vise and Rod Set Up Thin-Wall Threading Job

THIN TUBING was hand-tapped without crushing the walls or running the threads off at an angle by supporting the tubing on the inside and by holding the die and the work rigidly in relation to each other.

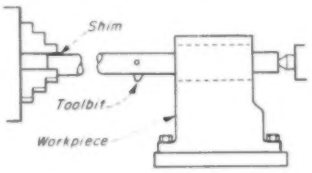
A piece of mild-steel rod about 16 in. long and with a running fit inside the tubing was driven into a block of wood and clamped to a bench. The die was slipped over the rod, located in center with the wide end of the die taper up, and held by a bench vise. The tubing was clamped in a wooden yoke, slid over the rod, and turned until the thread was completed. *G. Burnley, Oakland, Cal.*

Shim Adjustment in Chuck Changes Boring-Bar Cut

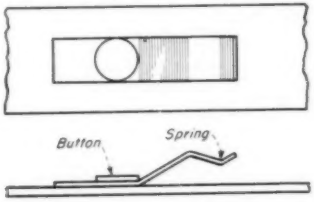
IN A SMALL SHOP a lathe with a boring table is invaluable, because large bores can be set up by mounting the work on the table and supporting the boring bar between the tailstock center and the spindle nose.

With large-diameter bores, the toolbit can be adjusted with a screw as successive cuts form the diameter, but with small holes this is difficult to manage. We found a technique for this situation that provides good accuracy.

At the head end of the lathe, we support the boring bar in a chuck, using only the outer $\frac{3}{8}$ or $\frac{1}{2}$ in. of the chuck jaws. Rough cuts were made by adjusting the boring bit by clamping it in a new position with the regular screw clamp. For the final cut, however, we had to adjust the cutter accurately, so we left the last adjustment of the bit as it was and adjusted the head end of the bar. This was done by loosening the jaws slightly and slipping a sheet-metal shim between the bar and the jaw on the opposite side of the bar from the bit.



If the shim were placed against the jaw on the same side as the bit, this would have reduced the diameter cut, so any adjustment under the size of the shim was made by rotating the bar in the chuck from the smallest diameter to the largest, as represented by the relative positions of the shim and toolbit. *Tom Penway, Cumberland, England.*

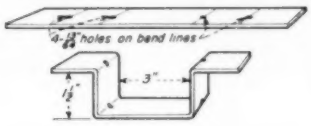


Weld Button Cuts Brittleness

ONE PROBLEM in spot welding a spring-steel part to a sheet-metal part is how to prevent brittleness in the joint. This can be minimized without special welding-control equipment by using a sheet-metal button in the welding operation.

The clip spring illustrated is welded to low-carbon sheet steel by placing the button on top of the spring. The button absorbs considerable heat during the welding operation, which prevents sudden quenching of the heated metal of the spring. In some cases, the button also causes a larger-diameter weld, which adds to the strength of the joint.

The method is probably not as satisfactory as a tempering- or post-heat-weld-cycle, but it is useful for single-impulse welding. *G. C. Farrington, Syracuse, N. Y.*

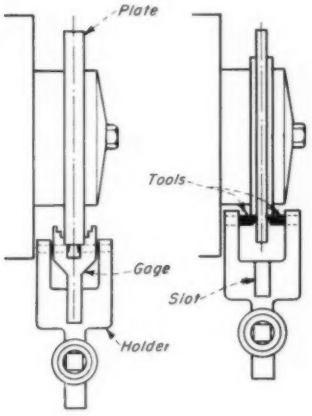


Bend-Line Holes Help Form Strap

RECENTLY we had a small job to bend without a power brake or a V-die, and heating and hammering did not give us an accurate enough bend.

On this job a hole along the bend line didn't matter, and I found that I could scribe the bend line, drill a small hole through in the middle of the part, and bend the strap in a vise with my hands. The bends turned out sharp.

The same method could be employed on wide stock by drilling a number of holes along the bend line, and, if necessary, welding them up after the bend was made. *Claude L. Pawl, Grand Rapids, Mich.*



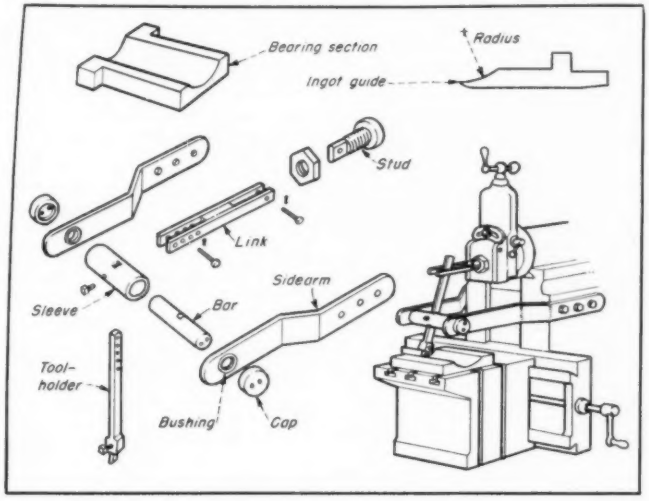
Stepped Templet Gage Centers Holder for Edge-Turning

A LARGE QUANTITY of round, 20-in. dia. plates were to be turned on their circumferences to form a double shoulder, or a shoulder on each face. Because the plates varied in size, and the shoulders had to center on the plates, a special gage was made to locate the double toolbits.

The two bits were mounted parallel to the lathe centerline in a yoke-type holder that was clamped in a standard toolpost. A slot was cut on the top of the holder to center with the toolpost, and to take a small sheet-metal gage templet.

The work was clamped to the lathe faceplate by means of a clamping plate and bolt. Then the holder was adjusted to center on the edge of the unmachined plate by dropping the gage into the slot and matching one of the slots in the gage with the edge of the work. With the holder centered, the carriage was locked, the work rotated, and the cross-slide feed used to turn both edges of the work.

Some applications might require the use of a V-form instead of the spaced steps cut on the gage, but in this case the steps were convenient and easy to cut. *F. G. Forquer, Buffalo, N. Y.*



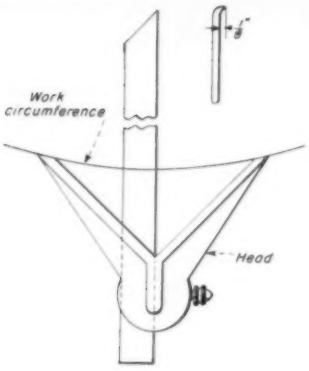
Reciprocating Tool in Adapter Cuts Radii on Shaper

SPLIT BEARING SECTIONS for rolling mills can be cut in a number of different ways—in our shop we first bored them on a lathe. This was slow and patient work, though, and when our shaper was available we moved the job to that machine.

An adapter added to the shaper head allowed us to cut radii with good accuracy in practically any stock we could mount on the shaper table. Two heavy sidearms were bolted to the sides of the machine to support a slotted bar. The bar was held on the arms by countersunk caps screwed into the bar. Bronze bushings in the sidearm holes carried the bar, and a sleeve slotted like the bar and carrying a setscrew was mounted over the bar for extra support.

A link made from two pieces of flat stock with adjustment holes drilled through it connected a stud that replaced the normal toolpost and a toolholder that was clamped in the slotted bar and sleeve. A number of holes drilled in both the connecting link and toolholder allowed adjustment of the linkage after the tool was set at the required radius from the center of the slotted bar.

The adapter was useful for many jobs other than the bearing sections, including a radius cut on ingot guides. *Victor Melendez, Monterrey, Mexico.*



Layout Tool Scribes Circles

CONCENTRIC CIRCLES on pieces that have been drilled and therefore have no center for supporting a compass are marked with a tool that rests against the OD.

The flat center piece of the tool is sharpened at the end, forged over, hardened, and ground to a good point. It fits in a standard center head or a combination square head.

The only precautions necessary for accuracy are that the arms of the head are of equal length and the scriber point is aligned with the center of the head. *Jerome Grossman, Lynn, Mass.*

File-Knurling Increases Pin Diameters

AN INSTRUMENT I was working on some time ago required a number of 0.0625-in. drill-rod dowel pins. These had to be a light drive fit in one part and a push fit in the matching part. The job was accomplished as follows:

The holes in both parts were line reamed with a 0.0625-in. machine reamer, and the pins were cut to size. Then the pins were laid on a piece of hardwood, and a bastard file was pressed over one half of each pin. The pins were rolled with the file to produce a fine knurl on half of each pin.

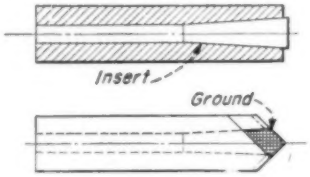
This technique produced a drive-fit size on the knurled ends, and surely beat flattening or centerpunching the pins. *Jack Harris, Long Island City, N. Y.*

Shaper Setup Scribes Layout

NOT EVERY toolmaker is lucky enough to have a jig borer handy. Nevertheless, there are methods by which a toolmaker may make a precise layout. This is a method we used with success:

Take a robust scriber and clamp it in the shaper toolholder. Then wedge or clamp the clapper box to eliminate all play in any direction. The work is placed in the shaper vise, and the vertical feed is adjusted so the scriber will cut to the right depth to make clear lines on the work.

Now the ram is reciprocated by hand power. The lines are spaced by adjusting the cross-feed handle, which gives good accuracy. After the lines in one direction are completed, the work is shifted in the vise and the lines in the other direction are scribed. This same method can be employed for indexing and circular layout work. *Federico Strasser, Santiago de Chile.*



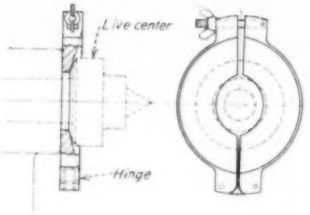
Carbide Toolbit Pressed Into Steel Shank

CARBIDE is the cutting material in a boring tool we made in our shop. The material was a commercial piece formed with a taper, which was pressed into a steel sleeve that was bored and taper-reamed to fit.

The assembly was ground off to a standard boring-tool shape and was installed in a bar, locked with a setscrew. It is used in both lathe and milling-machine setups for boring holes. *Roger Vicaire, Brussels, Belgium.*

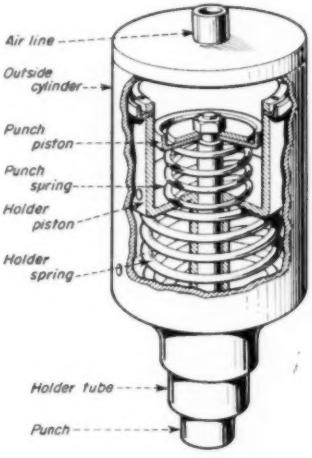
Clamp Squeezes Live Center Out of Tailstock

MOST LIVE CENTERS on the market today do not have tangs, so they are not easily removed from the tailstock. I made a small clamp-



type tool that will remove centers without any special fitting.

The clamp is inserted between the tailstock and the center, with the tapered part of the wedge toward the center. Then the thumbscrew is closed and tightened to force the center out. *Raymond H. Crum, Frederick, Md.*



Air Punch Has Double Action

THIS IDEA is a double-acting air cylinder, made in the shop, for clamping, blanking, and piercing light materials.

Air enters the cylinder and forces the holder piston down first against the holder spring. When this is stopped by the work or die, the pressure acts against the punch piston, which is backed by a stronger spring, and the punch blanks out a slug.

The arrangement was employed to blank and form caps made of thin plastic, and also to trim the flash from plastic parts. *A. C. Good, Dayton, Ohio.*

NEWS OF METALWORKING

Major Steel Users Work to Reduce Inventories; Watch Labor Situation

NEW YORK—With the country's major users of steel rapidly working to reduce their steel inventories anywhere from 30 to 90-days' supply, some more, some less, it looks like the third quarter is going to be thin for the steel industry.

That steel people know this is indicated by the number of users reporting they have seen more steel salesmen recently than have been around for several years.

Big steel users in the Cleveland area have what they term a comfortable inventory of steel. A few are still working off their inventory gradually while others have trimmed their stocks and are now replacing on basis of customer orders. No one apparently is enlarging inventory of steel and evidently most have reached a point below which they cannot drop.

Cleveland manufacturing, being tied so closely to the automotive industry through production of parts, more or less reflects conditions in Detroit. And with the automotive industry remaining at a high productive rate, Cleveland part suppliers are comfortably busy.

In Detroit, the feeling that steel prices may go down has been a factor in the lowering of inventories. But the insurance buying to hedge against a strike has been a balancing factor against the price fears, particularly in the last few weeks.

Steel Production Going Down

With reduced inventories, steel production is down, and may go down more. In the closing week of June steelmaking furnaces were scheduled to operate at 79.9% of capacity, the lowest weekly percentage rate in nine years. Feeling in the field is that steel operations might fall off to somewhere between 70% and 75% before the reduction ended, with some seeing it down as low as 65%.

Automobile companies by and large have inventories on hand or enroute enough to carry their requirements about 30 to 60 days. C. E. Wilson, president of General Motors, told a group of dealers recently that the company has scheduled 12,500 cars daily through to September, and that even with a steel strike in mid-July the August schedule could probably be finished. Even with a coal strike, holding up some steel production, GM believes that September schedules might be completed.

While some automobile makers are modestly reducing their releases (go aheads on purchase orders), they have been balanced by some mild increases. No one among the major steel users, including those who supply the car manufacturers, is now out of the steel market.

Chicago Companies Polled

AMERICAN MACHINIST polled major steel users around the Chicago area to get this steel inventory picture, based on present activity:

A large manufacturer of automotive and lubrication equipment and devices—Now has four and a half months' stock on hand, wants to reduce to two and a half. Will be back in market in about three to four months.

Big maker of chain, conveyors and power transmission devices—Reports various divisions have varying stock on hand, four to eight months, with average of about five months. Slowly bringing inventory down to three to four months' supply. Still in market, buying according to needs as indicated by incoming orders. Commitments have been cut about 20%. Diversified line keeping activity at high level, about 85% to 90% of year ago.

Large maker of earth moving equipment, cranes and hoists—Has four and a half months' stock, wants to reduce to 75- to 90-day inventory. Expect to be out of market except for specials for 60 to 90 days—most of third quarter. Activity down about 25% from year ago.

Important middle western maker of welded products—Not out of market though some divisions of company holding back orders to keep inventories in line with current needs.

Major maker of welded tank trucks and truck bodies and other welded products—60 to 90-day inventory, reducing to 30- to 60-day fast as possible, cutting stock on hand to suit incoming orders. Will be out of market except for special steels until September or October. Now operating at about 75% of year ago.

Well-known maker of industrial and marine gears and gear reducers —60 to 90-day inventory, quickly reducing to 30 days. Will be out of market until about September, getting inventory down to what seems to be proper level for future. Present activity is about 70% of year ago. In future will buy in small quantities, according to needs and necessary lead time.

Large maker of electrical apparatus and other products for many in-

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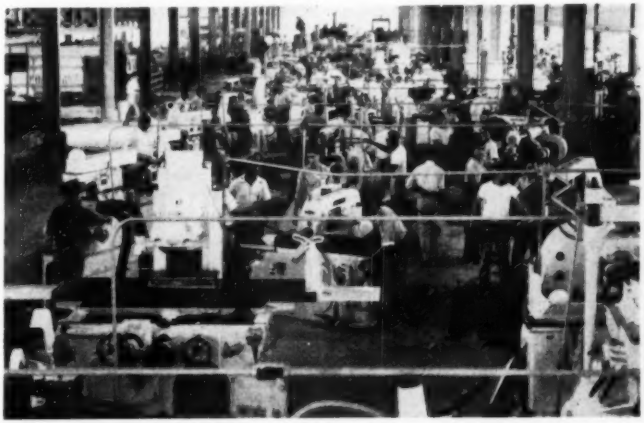


***METALWORKING** skills are learned here in the largest vocational training school in the world, at the University of Puerto Rico, where $17,000,000 of surplus war equipment has been installed to train students in fifty different trades, including auto mechanics, refrigeration, metalworking and airplane mechanics*

Steel Users Reduce Inventories

(Continued from Preceding Page)

dustries—Has five months' stock on hand, is reducing inventory of steel to 60 days' supply. Expects to be back in market in about three months.

None of the Chicago firms queried indicated that the possibility of steel price cuts has prompted inventory reduction.

Cleveland Suppliers Cut Inventories

Cleveland parts suppliers, sensitive as they are to the automotive industry, are holding inventories to operating orders from their customers. Thus the largest user of hot rolled sheet and strip in the area is carrying sufficient inventory for 45 days' operation. Another large parts supplier has been working steel inventory down since March, believes it is comfortably situated with 40 days' supply. Another large parts supplier has its steel inventory on a 30-day basis.

None of these large users expects to change except as incoming orders dictate. However, in the three instances named those companies have never had any great difficulty in getting the amount of steel necessary for their operations.

Some other companies in the Cleveland area—a manufacturer of road machinery is an example—have reduced steel inventory almost to a day to day supply with shipments from mills now being made on a 30-day basis except in the case of special alloys. While mills are asking 45 to 60 days for delivery, customers are finding no difficulty in securing all the steel they want, and to their specifications, on 30-day orders.

West Coast Stocks High

One San Francisco area steel supplier reports that its stocks are so far in excess of normal inventory that it will not be back in the normal market before the last quarter of this year or the first in 1950. Its sales have dropped 25% to 30% since January.

Another supplier in that area terms its inventory in "excellent" shape, although it has a six to eight month supply over its average three to four months. A company spokesman said that almost all steel buyers in the area were in a similar position—that "the decline came at a time when most people were predicting a sold-out market for another six months." He added that lots of steel is being put on the market by manufacturers who are oversupplied.

A calculating machine manufacturer has about five months' inventory, compared with a desirable three months' supply, and has been "riding on its inventory" for the past six months. Another is cutting its inventory at the rate of 10% a month to 35% of the amount it had been carrying, or to about three months.

Informed sources in the Los Angeles area believe that inventories will be down close to normal by midsummer, with a corresponding increase in demand. Sales to the aircraft industry have been steady and construction remains at a high level.

Polling users there, AMERICAN MACHINIST learned this inventory situation:

An important maker of steel drums, tanks, boilers, furnaces—Has 15,000 tons of steel on hand, which will last 30 days. The company has reduced its inventory from a 45- to 30-day supply. Now purchasing 20% less steel per month than year ago.

Maker of oil well and structural steel equipment—Has 500 tons on the surplus list, doesn't know how long it will last. "We are buying no steel except what we need for orders."

Maker of wheels and other automotive parts—Supply will last a normal 30 to 45 days. Company is purchasing a normal amount of steel.

British Drop Forging Group Visits American Plants Here

WASHINGTON—The United Kingdom's drop forging productivity team now in this country for a study of American methods and techniques of producing steel forgings is slated to visit seven plants in July.

The 16-man team, composed of workers, supervisors and technicians, is the third to visit the U.S. under auspices of ECA and the Anglo-American Council on Productivity.

Oerlikon to Build Machine Tool Factory at New Delhi

ZURICH, Switzerland (McGraw-Hill World News)—Oerlikon Machine Tool Works, Buehrle & Company of Zurich has come to an agreement with the Government of India in New Delhi for establishment of a machine tool factory with a capital of 120 million Rupees ($36,600,000). One third of the needed machines will be furnished by Oerlikon, the rest by other firms of Switzerland and other countries, through the agency of Oerlikon, which will build and equip the new establishment to the point of production.

ASTM Elects New Officers

PHILADELPHIA—New officers announced by the American Society for Testing Materials are: President, J. G. Morrow, metallurgical engineer, The Steel Co. of Canada, Ltd., Hamilton, Ontario; vice president, Frank E. Richart, research professor of engineering materials, University of Illinois, Urbana; directors, Robert D. Bonney, assistant manager of manufacturing, Congoleum-Nairn, Inc. Kearny, N. J.; C. H. Fellows, head of chemical div., research dept., Detroit Edison Co.; Harrison F. Gonnerman, assistant to vice president for research and development, Portland Cement Assn., Chicago; Norman L. Mochel, manager of metallurgical engineering, Westinghouse Electric Corp., Philadelphia; M. O. Withey, dean of college of engineering, University of Wisconsin, Madison.

GISHOLT VETERANS *David Wright (left) and Edward Johnson were presented with diamond pins and gold watches upon completing 50 years with Gisholt Machine Co., Madison, Wis. Here they are being congratulated by S. John, vice president and treasurer, and by President George H. Johnson*

50 YEARS AGO *Timken bearings were turned out this way. For the open house at the Gambrinus plant in Canton an old wooden-walled shop was simulated with workmen operating 50-year-old tools*

TODAY *an inspector measures length of cone assembly, on this polished table finished to 51 millionths of an inch for flatness*

Timken Celebrates Fiftieth Anniversary

CANTON, Ohio—Going beyond usual open-house procedure of guiding townspeople and employees' families through company plants, The Timken Roller Bearing Co., in celebrating its 50th anniversary June 20-24, seized the opportunity to point out the effect of present high taxes on operations.

On display in a transparent plastic box were 58,179 silver dollars, representing $40,000 the company pays and $18,179 it withholds from employees' wages each working day for direct federal taxes.

Throughout the tour, large signs pointed out the cost of individual machines and departmental equipment, and showed their present replacement costs and the percentage of increase, in each case indicating that taxes were a major factor both in increasing new-equipment costs and in restricting modernization.

Also shown were original and replacement building costs. Other signs showed the annual bill for utilities such as electricity, gas, water and coal, and the annual cost of purchasing such items as pig iron, steel shot, abrasives, industrial diamonds, and such familiar items as soap and work uniforms.

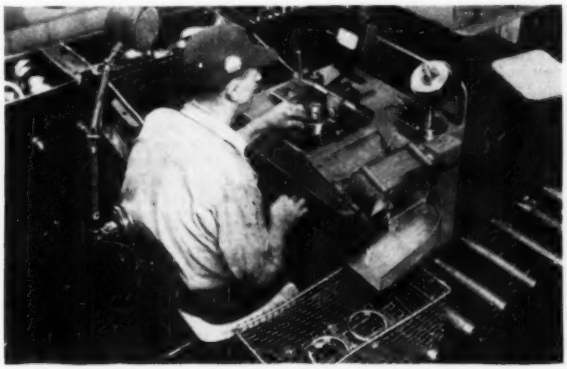
A preview of the open house was given to some 1500 customers, suppliers, and the press June 16-17. About 60,000 people visited the plants during the five days of open house.

To point up the contrast between 50 years ago and today, a number of 50-year-old machine tools were set up in one area in the Gambrinus plant to simulate an old wooden-walled shop. Tools were manned by a dozen workmen equipped with derbies and moustaches. This unit turned out souvenir bearings by the original hand methods for the period of the exhibit.

To acquaint visitors with its new 59-acre recreation field, the company set up four circus tents there, two housing a display of 50 antique automobiles all in working order, the third a display of employees' hobbies, and the last a refreshment tent, where free soft drinks were available.

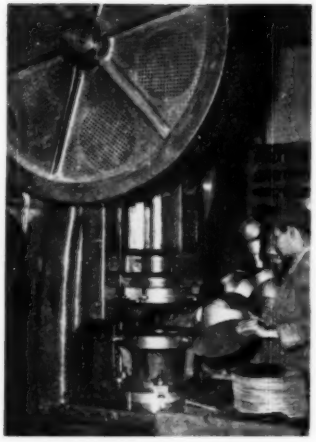
This looks like a lot of money BUT
the Federal Government will spend
2934.9 times this much today.
$173,076,920.00 IN ONE DAY
TAXES ARE PRETTY HIGH

TIMKEN PRESIDENT *Wm. E. Umstattd looks over the unusual display which impressed visitors to the open house*



VISITORS SAW *how a blind employee operates an electronic sound-gaging device in the Canton plant. The device was developed over a period of years by Timken engineers to give employment to the blind*

***ELECTRIC MOTORS**— single phase fractional and three-phase up to 75 hp— come from the Sao Paulo plant of Arno S.A. Industria e Comercio, who claims to make 60% of all motors manufactured in Brazil*



***POTS AND PANS** from sheet aluminum rolled at new mill of Industria Sul Americana de Metais*

Metalworking Booms in Sao Paulo . . .

By HENRY BAGLEY
(McGraw-Hill World News)

SAO PAULO, BRAZIL—Metalworking, spurred by war-time and post-war shortages of normal imports, has become a top industry of Sao Paulo, Latin America's fastest-growing industrial city, and the surrounding state. Although production is piddling compared with such a giant as the United States, output in some lines may eventually fill national demand.

Several American manufacturers, aware of the trend, have started or are expanding their own local production. Dollar shortage for imports and remittances has been a major factor in this expansion.

Metalworking, taking it down the line from foundries to nut-and-bolt producers, probably ranks fourth today in Sao Paulo manufacturing, behind textiles, mechanical industries and food products.

Metalworking Output at $110 Million

Official statistics list value of metalworking output in the city of Sao Paulo and its industrial suburbs in 1947 at 2.1-billion cruzeiros ($110 million), or roughly one-twelfth of the city's total industrial production that year. Figures for the rest of the state are not available, but the bulk of output is in the city and its environs.

Sao Paulo is not, of course, the only site of metalworking in Brazil —but it is by far the most important. Output for all the rest of the country probably does not exceed that of Sao Paulo alone.

In 1947, the last year for which official statistics have been compiled, 505 metalworking establishments in Sao Paulo city reported 32,284 workers, of whom more than 1000 were proprietors. Since some 90 of these plants had over 100 employes (with an occasional firm having over 1000), it is clear there were many very small shops.

Industry Jumped During War

Sao Paulo's metalworking industry, like the even more important textile industry, took a tremendous spurt during the war. Hundreds of little firms sprang up almost overnight—some of them nothing more than a man and his brother making screws in a cellar, but some of them big plants with complicated operations and elaborate machinery.

Many of the "little fellows" already have succumbed. Most of them never expected to stay in business after the war, and in many cases have gone to wage jobs as foremen or workers in bigger plants.

Earnings in Sao Paulo metalworking in 1947 were 13.1% of the capital and surplus, according to figures quoted in the recent report of the Joint Brazil-U.S. Technical Commission ("Abbink Report"). Several other industries showed much higher percentages.

The machine-tool industry got a brief uplift from the war, but fell back with the arrival of better foreign articles. One of the bigger firms folded, another switched mostly to imports; others are hanging on, some of them making good products, improving their techniques.

In spite of wartime shortages, the U.S. enlarged its sales to Brazil between 1940 and 1944 of iron and steel, machinery, apparatus, tools and utensils and other iron and steel manufactured articles, in both tonnage and value, although total U.S. sales to Brazil dropped heavily.

That expansion reflected both Brazil's efforts to augment her own industrial output and American attempts to aid our war-time ally in that program. Such projects as Export-Import Bank help in financing Brazil's new Volta Redonda steel mill, begun in war-time and finished afterwards, were representative of this co-operation.

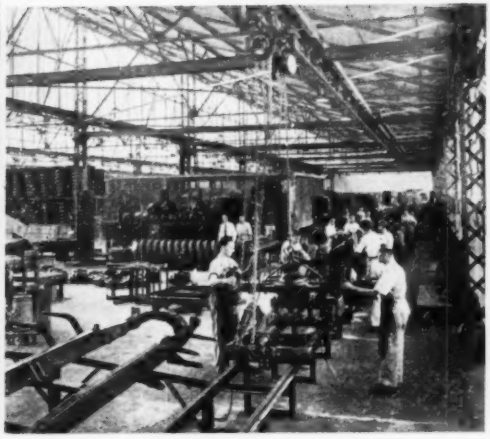
Germany, which gave the U.S. a big battle in the Brazilian market in the late 1930's, has of course been knocked out; but Britain, Sweden, France, the Low Countries, Switzerland, Italy and Czechoslovakia are picking up.

Demand for American Machinery

But there is practically undiminished demand for American heavy equipment, machinery, refrigerators, machine tools, precision instruments.

Basically, the technology behind the industrial expansion in Sao Paulo metalworking is American. In the new firms, most of the equipment is American; there was no other place to buy the machines until recently, and generally the owners and technicians agree that U.S. machinery is excellent. There are, of course, exceptions. For example, some lean toward some Swiss precision instruments, some seek British heavy equipment. Both these nations

METAL CONTAINERS, *more than 500,000 daily, are made by Sao Paulo plants of Metalurgica Matarazzo, Brazil's biggest can manufacturer*



CHRYSLER TRUCKS *and cars are assembled at this Brasmotor plant at yearly rate of 3000-4000. Brasmotor plans to make refrigerators eventually*

. . . as Brazilian Industry Expands

have come back into the market in a fairly big scale.

Guiding spirit behind much of Sao Paulo's industrial development, especially in metalworking, is the Institute of Technological Research, a partially self-sustained organization connected with the Polytechnic School of the University of Sao Paulo.

Under Adriano Marchini, its director, the Institute has leaned heavily on United States technology. In the metallurgical and metalworking fields all his top technical men have had specialized courses in the United States. During the war, an American government technical mission in Brazil worked closely with the Institute of Technological Research.

Some of Leaders in Sao Paulo Metalworking Industry Listed

A rapid survey cannot attempt to report on more than a small percentage of th important firms in the Sao Paulo metalworking industry.

Most spectacular of the Sao Paulo industries which rocketed into dominant positions during the war were the Francisco Pignatari companies.

Here is a listing of some of Pignatari's companies:

Laminaçao Nacional de Metais S.A.—makes non-ferrous plates, sheets, strips, shapes, wire, etc., as well as aluminum and bronze powders.

Companhia Brasileira de Artefactos de Metais—consists of two factories, the Wolff tableware plant and the Rochedo utensil plant. The Wolff factory makes iron and silver cutlery, as well as other metalware.

Companhia Brasileira de Metais—makes four types of zippers, of which it sold nearly 10-million feet in 1946, worth $1,362,909.

Laminaçao Caravelas S.A.—sold $556,479 worth of aluminum foil in 1946.

Fabrica de Caldeiras a Vapor Cyclope S.A.—sold steam boilers and oil and gasoline tanks to the extent of $1,144,523 in 1946.

Companhia Brasileira do Zinco—sold $284,239 worth of its electrolytic zinc, sulfuric acid, copper and zinc sulfate in 1946.

In 1947, Pignatari and Aluminum Limited of Montreal formed "Aluminio do Brasil," to produce aluminum sheet, coil, foil and shapes. Pignatari himself also planned to construct another non-ferrous metal rolling mill, with capacity of 3000 tons monthly of coil, tubes, bars and shapes, all made of copper alloys.

Major Competition in Revere Firm

One of Pignatari's major competitors will be *Industria Sul Americana de Metais S/A*, now half owned by Revere Copper and Brass, Inc.

Founded as a kitchen utensil plant in 1943 by Dr. Luiz Eduardo Campello, this company is operating a new rolling mill which, for the past year, has been producing sheets, strips and coils in copper, brass and aluminum and also drawn electrical copper bars. Sheet aluminum for the kitchen utensil factory is being rolled at this new mill, capacity of which is estimated at 500 tons per month.

A war-baby in the metal-manufacturing line is *Arno S.A. Industria e Comercio*, which says it makes about 60% of all the electric motors manufactured in Brazil.

Arno's equipment includes 55 individually motorized lathes, 10 planners and shapers, 3 milling machines, 17 drilling machines, 5 grinding machines, 17 pedestal grinders, 5 mechanical saws, 21 excentric presses, 4 hydraulic presses, 2 plate shears, 5 complete electric welding outfits, several pressure die-casting machines, and a testing and research laboratory.

Codiq Builds Chemical Plant

Another war industry which is holding on is *Codiq S.A., Equipmentos Industriaes*, builder of alcohol distilleries and chemical installations. It has, however, undergone a recent shakeup in its directorate.

The company uses copper from the U.S. and Chile, steel from the U.S. and the new Volta Redonda mill and stainless steel from the U.S.

Much of the machinery is American, much is Brazilian and some is European. All production is, of course, by order.

Cobrasma Makes Railway Equipment

A war-time development is *Companhia Brasileira de Material Ferroviario* ("Cobrasma" for short), which is making much railway equipment, but has been delayed by slow deliveries of machinery and materials from the United States.

Cobrasma's plant at Osasco, about 15 miles from the center of Sao Paulo, is on a 78-acre property, served by the Sorocabana Railway

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Metalworking in Brazil

(Continued from Preceding Page)

and the Santos-Jundiai Railway. There a freight car assembly shop and carpenter shop are functioning, together with a steel foundry which began operations in May 1948 and casts 300-400 tons monthly. Giffels and Vallett, Inc., an American firm, made the plans for the steel foundry, which produces truck parts, couplers and draft gears for railway cars, and steel castings for car and locomotive repair work and for local industries.

Long Established Firm Makes Scales

Those are examples of firms which originated or rose spectacularly during the war and now are leaders in their fields. Not all of Sao Paulo's metalworking industry is so new; many old firms have held or gained leadership.

Take *Industrias Filizola S.A.*, which turned out its first scales in 1886.

The firm makes 2,500 to 3,000 scales a month, of which 750 are automatic. Variety ranges from scales which will take a maximum of one kilo to those taking 100 metric tons. The Filizolas also make cold meat slicers.

Industrias Filizola hopes to build a mechanized foundry. Machinery which cost about three million dollars is on hand. The foundry is planned to produce 200 tons of parts for scale monthly, with expansion to 400 tons a possibility.

Pirelli Makes 'Phone Wires

Anywhere in Brazil that you see telephone lines being installed you probably will see a great wooden spool bearing the name *Pirelli S.A.*

Pirelli makes telephone wire and cables up to 2,400 pairs and power cables up to 25,000 volts. Nobody else in the country manufactures this equipment. Pirelli also produces wire and cables for other uses: autos, planes, homes, naval vessels.

Matarazzo, Biggest Can Maker

Brazil's biggest can manufacturer, *Metalurgica Matarazzo*, is an associate of Continental Can Company, of New York.

Founded in 1924, the company originally had a rolling mill for nonferrous metals and an iron foundry, and manufactured tin plate containers, aluminum utensils, buckets, pails, water heaters and jewelry, but by the time it associated with Continental Can it had quit all lines except metal containers.

Besides one large and two small plants in Sao Paulo, Metalurgica Matarazzo controls a factory in Rio de Janeiro, the Metalgrafica Brasileira S/A, which has just started operations. It also operates a factory in Recife and another in Lavras (state of Minas Gerais).

GE Important in Brazil

Of the new developments by American companies in metalworking in the Sao Paulo area, that of *General Electric* is among the most important.

GE has just opened a factory making integral-horsepower motors for industry. It will undoubtedly cut into the business of Arno S.A. and of smaller motor manufacturers.

Automobile Plants Expand

American automobile companies also are expanding in Sao Paulo.

General Motors has more than doubled the area of its assembly plant to about one million square feet, and expects to have about 2,000 employes. The plans have gone forward despite exchange restrictions which reduce potential importation of passenger cars. GM figures on big output of trucks, which get better exchange treatment.

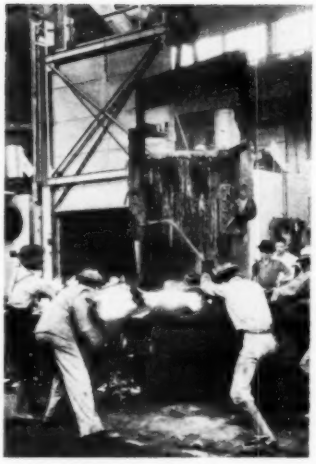
Chrysler has come in since the war with an assembly line, through *Companhia Distribuidora Geral Brasmotor*, which has 40-million cruzeiros ($2,000,000) paid in and registered capital. Chrysler itself has no stock in the company.

John P. Schmeider, formerly Chrysler Export Corp. representative in Brazil, is director-general of Brasmotor, which is assembling at the rate of 3,000-4,000 trucks and cars per year, employing about 350 workers of its total of about 700 in the 11,000 square meter assembly plant.

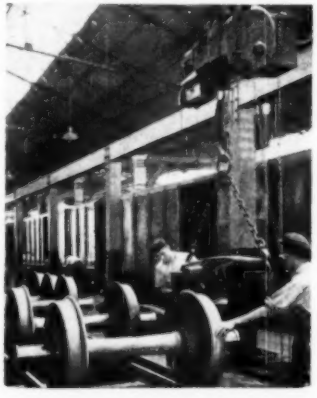
Brazil Depends on Metalworking Imports

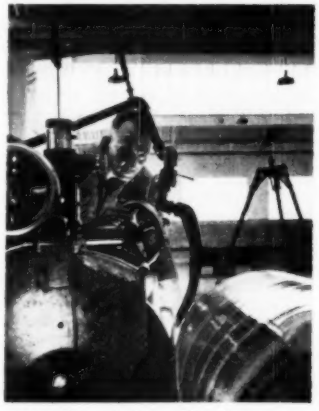
Despite her industrial expansion, Brazil is still partly dependent on imports in practically all metal lines. Here are some important figures for 1948:

	Metric tons	Value in 1000 cruzeiros
Iron and steel	46,132	183,347
Machines, apparatus, tools and utensils	149,232	4,772,260
Iron and steel manufactured articles	211,283	985,003
Vehicles and accessories	225,233	3,712,164
Total	631,880	9,712,164



***NEW FOUNDRY** at Cobrasma supplies the freightcar assembly shop below*





***GRINDING** rolls for rolling brass, copper, aluminum—Industria Sul Americana de Metais*

4 Vermont Firms Hold Tool Show

SPRINGFIELD, Vt.—Jones & Lamson Machine Company, The Fellows Gear Shaper Company, and Bryant Chucking Grinder Company here cooperated with Cone Automatic Machine Company, Inc., at Windsor, Vt., 17 miles away, to hold a combined display of developments since the 1947 Machine Tool Show, during the week of June 20.

Among spectacular exhibits was a 16-in. Fay automatic lathe, carbide tooled to produce an automotive stem pinion. All contours and the small end were turned simultaneously with the piece on centers. Instead of being chucked, the piece is driven by a series of flat radial spurs surrounding the live center. The hydraulic tailstock closes under 14,000-lb pressure to impale these spurs in the piece. Pressure is reduced to 1200 lb as the cuts start, so the dead center will not spread the small end. Twelve tools cut at once at a maximum surface speed of 1185 fpm. Turning time is 8.5 sec, floor-to-floor time 17 sec. During turning, the entire cutting area is inclosed by a plexiglas guard which is operated hydraulically.

***VERMONT TOOL SHOW**—One leg of the "L" shaped exhibit at Fellows. In center foreground is the new gear finisher, at left the new six-spindle planetary and at the extreme right the gage-pinion shaper, a completely automatic machine*

New Gear Finisher Shown

Fellows Gear Shaper showed a new gear "finisher"—which is in effect a single-tooth gear shaver. A conventional gear-shaper cutter is carried on an adjustable spindle in crossed-axes relationship with the spur gear to be finished. They rotate together as the cutter is fed across the teeth. Crossed-axes setting causes the cutter to take a series of shallow shaving or scooping cuts, perhaps 0.00025 in. deep and 0.010 to 0.040 in. wide, depending on feed. Thus the resulting surface has a pattern of minute depressions which are said to reduce sound when the gear meshes in service and to facilitate lubrication by trapping minute quantities of oil in the pockets. Appreciable chips may be removed if desired.

Bryant Chucking Grinder showed a 16-in. swing, No. 216 internal grinder tooled to finish-grind the large diameter of a rough-bored automotive connecting rod to 0.0005 in. tolerance. Finish is within 20 microinches and the job is done on a 30-sec cycle.

Other Jones & Lamson exhibits included a series of three 16-in. Fay lathes, turning a 6¼-in. outer bearing race at speeds as high as 1065 fpm for a total time on the three operations of 70 sec. Also shown was an 8-in. Fay lathe with mechanical loading and unloading, a ram-type turret lathe demonstrating 2,000-rpm threading with carbide dies, and a new type 7A saddle-type turret lathe.

Bryant showed the cam-operated grinder described in *A.M.*, June 2, and several machines doing high-precision grinding, one on diesel fuel injection nozzles, one on ring gages and one on 7-mm. dia bores. The latter included a high-frequency wheelhead operated at 90,000 rpm.

Cone Automatic Machine Co. featured a machine turning out a large diameter cap nut from 2¾-in. steel stock in 40 sec. This was done on a four-spindle 5-in. Conomatic with carbide tools. It included facing, knurling and pilot drilling in the first position, finish drilling and forming and facing in the second position, finish forming inside and out in the third position, and center drilling and cutting off in the last. A 1-in. six-spindle machine turned out hex-head screws at a rate of 1800 per hour with a cutting speed of 768 fpm. All tools were carbide tipped. A 1½-in. six-spindle Conomatic turned out adjustable bolts at a rate of 276 per hour, again with carbide-tipped tools. Emphasis in these exhibits and in others of Cone was upon the ability of this type of machine to handle short and medium-size runs. Emphasized were the low costs of the tooling and the speed of changeover. Cone is also completing a 5-in. single-spindle bar machine which has a number of new features, including adjustable toolholders and completely electronic drive.

Fellows also showed a small gear shaper cutting a U. S. Gage pinion at a rate of 600 per hour.

Tool Inquiries at Postwar Peak

NEW YORK—A lively inquiry about tools, with some hesitancy to close orders, was reported by L. D. McDonald, president of the National Machine Tool Builders Assn. in appraising the outlook for the industry at a press conference following a regional meeting of the NMTBA here June 23.

This "hesitancy" he charged to the possibility of fourth-round wage increases, the question of coal or steel being cut off by strikes, and the uncertain tax picture.

Harmful Depreciation Policy

One harmful aspect of the tax picture cited by Tell Berna, executive director of NMTBA, is the Treasury Department's depreciation policy adopted 16 years ago, which sets the period for write-off of machine tools at from 15 to 25 years.

Revision of today's income-tax depreciation rates on new machine tools, Mr. McDonald pointed out, would stimulate business by encouraging manufacturing plants to replace obsolete equipment with new cost-cutting tools. Management should have freedom of action in setting the period for writing off equipment. "They should be allowed to recover costs in the time it takes the machine to pay off," he stated.

The United States now stands almost alone in maintaining depreciation policies based on estimated physical life of equipment, the NMTBA spokesman stated.

Detroit

CAR AND TRUCK PRODUCTION REMINISCENT OF '29 . . . NEW REO ENGINE
HUDSON HIGH COMPRESSION DRAWS INTEREST . . . TALK OF SMALL NASH

The big news out of Detroit these days is that the car and truck industry is operating at a daily rate reminiscent of 1929. Full weeks in the period preceding mid-July were netting output totals within hailing distance of 150,000 vehicles every five days, and those kinds of totals are all but unprecedented.

They arise out of a marriage of two circumstances—the rather sudden loosening of steel, sheet as well as other shapes, and the continued seasonal demand for automotive products. The auto industry, than which nothing is more optimistic in bright periods, is now contemplating sustained operating schedules into the fall: The earlier worries about what would happen after Aug. 1 have momentarily been forgotten.

Nevertheless, less volatile observers still remember the sag of January-February, and take note of the fact that most dealers are having to get out and sell automobiles these days, rather than fill orders. These sideliners still have some wonderings about what will happen when the urge to get a new car for the summer and vacation season loses its steam.

Trucks in "Package" Deals

They note, too, that the truck market is going along on a definitely artificial basis. The manufacturers of trucks alone—as contrasted with companies making both cars and trucks—have had rough sledding. And the truck-car producers have been maintaining their truck volume in a number of instances simply because they are selling in "package" combinations—dealers getting passenger cars receive a specified proportion of commercial vehicles along with them.

This has resulted in some substantial truck price concessions at numerous points around the country, and the rest of the trade is looking with irritation on this state of affairs.

Mention of trucks brings up the fact that Reo Motors, Inc., has done a well-nigh impossible feat—starting into production on a brand-new engine, and getting an order for $31-million from the army for 2½-ton trucks driven by the new jobs. In all, Reo will build about 5,000 trucks on this new order, which will keep the company in nice shape through 1950.

To build the new engines Reo's machine shops have undergone a definite metamorphosis. The old equipment of the past, rugged, slow, and belt-driven, is giving way to crisp new special purpose machinery, a fair amount of it in the transfer classification, doing multiple operations with minimum manpower.

Reo is also setting up for something rather unusual—a temperature-controlled assembly room for critical fits. Pistons, pins, and other parts will be put together in a room where constant temperature will be maintained at 72 F. Parts are brought to this room and held for a few hours before assembly, in order that they will be in proper match when they are put together. This small and interesting detail is somewhat symptomatic of the care Reo has given the new engine.

Major industry gossip these days involves another new product of note—the Buick Special which is due to come out on the street toward the end of July or early in August. This will be the first adaptation of a new Fisher body design, intended for use in Olds and Pontiac as well, later on. The advance reports are that it is a superbly advanced conception, adding to the lustre of GM's line.

12.5:1 Compression Ratio

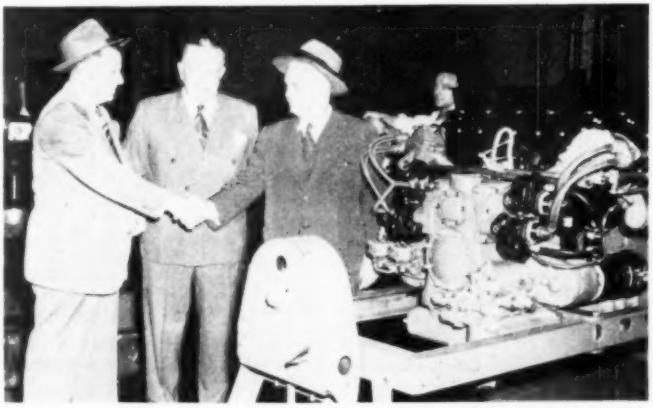
Elsewhere on the news front, Hudson Motor Car Co. drew more than a ripple of interest with recent word that its present engines are suitable, just about as they stand, for high compression modification. Using aluminum heads with redesigned combustion chambers, said Hudson engineers, their powerplant can be lifted to 9.3 to 1 compression ratio (for 100-octane gasoline) or, for that matter, to 12.5:1 whenever fuel becomes available for it.

The intriguing part of this announcement is that the Hudson engine is an L-head job, and up to now engineers have maintained that overhead valves are the primary feasible means of utilizing high compressions. But Hudson engineers say that fewer parts are required for L-heads, and that their job has been engineered rigid and heavy enough throughout to do a high compression job whenever the gas is distributed.

Hydra-Matic on Lincoln Cars

The Hydra-Matic transmission of General Motors has made a well-advertised appearance on Lincoln and Lincoln Cosmopolitan cars. What has not been announced, however, is that they are scheduled to show up later on Nash automobiles as well; that company has made a licensing deal with GM, it is understood, like that of Ford.

Nash is more openly in the gossip news with word that it is in advanced testing stages, and in fact may have already released some tooling, on a new small car. Hudson, too, has one of these smaller car designs around. Both may see customer showrooms within a year—and, as always in such matters, both might wind up before that time on the discard shelf.



***CONTINENTAL MOTORS CORP.**, Muskegon, Mich., has started manufacture of an order for $18 million in air-cooled tank engines for the Army Ordnance Dept. The first of the 12-cylinder 810-hp units, which comprise a major share of the line, is shown at the end of production, with factory officials congratulating each other. Left to right, Guy J. Harington, vice president; Albert B. Willi, vice president; and C. J. Reese, president*

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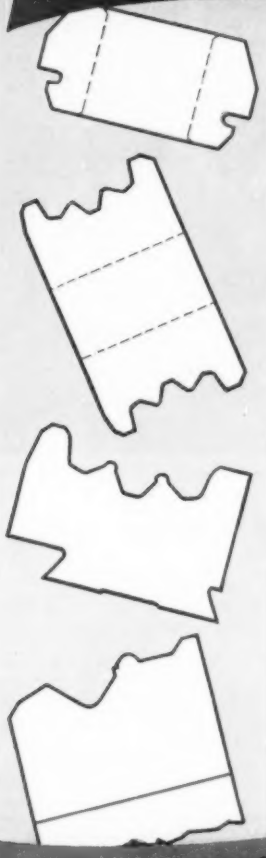

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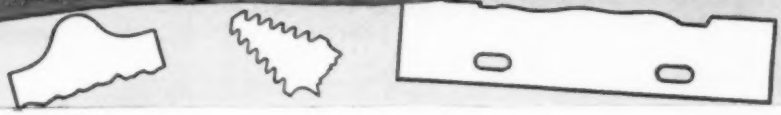

An example of chaetomium globosum (cellulose destroying mold) magnified 76 times

There's no money in growing mold!

Mold and bacterial action can play havoc in any shop. Machine down-time goes up —*production goes down*—because these microorganisms cause lubricants and coolants to go "sour."

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CHEMICALS INDISPENSABLE TO INDUSTRY AND AGRICULTURE

Hourly Output at 60 to 80% Efficiency

COURTESY NATIONAL SCREW MACHINE PRODUCTS ASSOCIATION

HOURLY PRODUCTION TABLE

Showing 60% to 80% Efficiency

Sec per Piece	Gross Prod. Per Hr	60%	65%	70%	75%	80%	Sec per Piece	Gross Prod. Per Hr	60%	65%	70%	75%	80%	Sec per Piece	Gross Prod. Per Hr	60%	65%	70%	75%	80%
1/2	7200	4320	4680	5040	5400	5760	12 1/2	288	173	187	202	216	230	50	72	43	47	50	54	58
5/8	5760	3456	3744	4032	4320	4608	13	276	166	179	193	207	221	52	69	41	45	48	52	55
3/4	4800	2880	3120	3360	3600	3840	13 1/2	267	160	174	187	200	214	54	67	40	44	47	50	54
7/8	4114	2468	2674	2880	3086	3291	14	257	154	167	180	193	206	56	64	38	42	45	48	51
1	3600	2160	2340	2520	2700	2880	14 1/2	248	149	161	174	186	198	58	62	37	40	43	47	50
1 1/4	2880	1728	1872	2016	2160	2304	15	240	144	156	168	180	192	60	60	36	39	42	45	48
1 1/2	2400	1440	1560	1680	1800	1920	15 1/2	232	139	151	162	174	186	62	58	34	36	39	42	46
1 3/4	2057	1234	1337	1440	1543	1646	16	225	135	146	158	169	180	64	56	33	35	38	41	45
2	1800	1080	1170	1260	1350	1440	16 1/2	218	131	142	153	164	174	66	54	32	35	38	41	43
2 1/4	1600	960	1040	1120	1200	1280	17	212	127	138	148	159	170	68	53	32	34	37	40	42
2 1/2	1440	864	936	1008	1080	1152	17 1/2	206	124	134	144	155	165	70	51	31	33	36	38	41
2 3/4	1309	785	851	916	982	1047	18	200	120	130	140	150	160	72	50	30	33	35	38	40
3	1200	720	780	840	900	960	18 1/2	195	117	127	137	146	156	74	49	29	32	34	37	39
3 1/4	1107	664	720	775	830	886	19	189	113	123	132	142	151	76	47	28	31	33	35	38
3 1/2	1028	617	668	720	771	822	19 1/2	185	111	120	130	139	148	78	46	28	30	32	35	37
3 3/4	960	576	624	672	720	768	20	180	108	117	126	135	144	80	45	27	29	32	34	36
4	900	540	585	630	675	720	21	171	103	111	120	128	137	82	44	26	29	31	33	35
4 1/4	847	508	551	593	635	678	22	164	98	107	115	123	131	84	43	26	28	30	32	34
4 1/2	800	480	520	560	600	640	23	156	94	101	109	117	125	86	42	25	27	29	32	34
4 3/4	757	454	492	530	568	606	24	150	90	98	105	113	120	88	41	25	27	29	31	33
5	720	432	468	504	540	576	25	144	86	94	101	108	115	90	40	24	26	28	30	32
5 1/4	686	412	446	480	515	549	26	138	83	90	97	104	110	92	39	23	25	27	29	31
5 1/2	654	392	425	458	491	523	27	133	80	86	93	100	106	94	38	23	25	27	29	30
5 3/4	626	376	407	438	470	501	28	128	77	83	90	96	102	96	37	22	24	26	28	30
6	600	360	390	420	450	480	29	124	74	81	87	93	99	98	37	22	24	26	28	30
6 1/4	576	346	374	403	432	461	30	120	72	78	84	90	96	100	36	22	23	25	27	29
6 1/2	553	332	359	387	415	442	31	116	70	75	81	87	93	105	34	22	24	25	26	27
6 3/4	533	320	346	373	400	426	32	112	67	73	78	84	90	110	33	20	21	23	25	26
7	514	308	334	360	386	411	33	109	65	71	76	82	87	115	31	19	20	22	23	25
7 1/4	497	298	323	348	373	398	34	106	64	69	74	80	85	120	30	18	20	21	23	24
7 1/2	480	288	312	336	360	384	35	103	62	67	72	77	82	125	29	17	19	20	22	23
7 3/4	465	279	302	326	349	372	36	100	60	65	70	75	80	130	28	17	18	20	21	23
8	450	270	293	315	338	360	37	97	58	63	68	73	78	135	27	16	18	19	20	22
8 1/4	436	262	283	305	327	349	38	95	57	62	67	71	76	140	26	16	17	18	20	21
8 1/2	423	254	275	296	317	338	39	92	55	60	64	69	74	145	25	15	16	18	19	20
8 3/4	411	247	267	288	308	329	40	90	54	59	65	68	72	150	24	14	16	17	18	19
9	400	240	260	280	300	320	41	88	53	57	62	66	70	155	23	14	15	16	17	18
9 1/4	389	233	253	272	292	311	42	86	52	56	60	65	69	160	22	13	14	15	17	18
9 1/2	379	227	246	265	284	303	43	84	50	55	59	63	67	165	22	13	14	15	17	18
9 3/4	369	221	240	258	277	295	44	82	49	53	57	62	66	170	21	12	14	15	16	17
10	360	216	234	252	270	288	45	80	48	52	56	60	64	175	21	12	14	15	16	17
10 1/2	342	205	222	239	257	274	46	78	47	51	55	59	62	180	20	12	13	14	15	16
11	327	196	213	229	245	262	47	77	46	50	54	58	62	185	20	12	13	14	15	16
11 1/2	313	188	203	219	235	250	48	75	45	49	53	56	60	190	19	11	12	13	14	15
12	300	180	195	210	225	240	49	73	44	47	51	55	58	195	18	11	12	13	14	14

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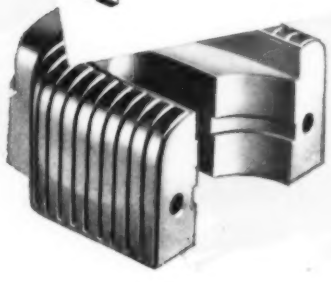

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Power Required for Punching

BY TYLER G. HICKS

The accompanying chart permits quick estimates of the power required to drive punching machines. An equation developed by L. P. Pomeroy* for punching machines with motor efficiencies of 80% and machine efficiencies of 75% is the basis of the chart. Pomeroy's equation is:

Where $$P = \frac{t \times D \times N}{3.78},$$

P = horsepower required to drive machine

t = full thickness of plate, inches

D = diameter of hole punched, inches

N = number of holes punched per minute

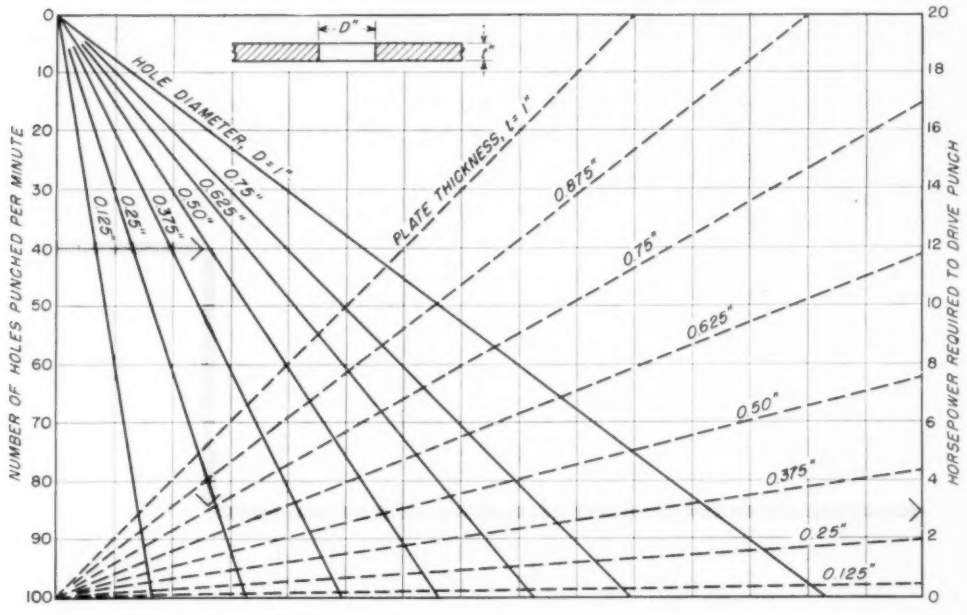
*American Machinists' Handbook, 8th Edition.

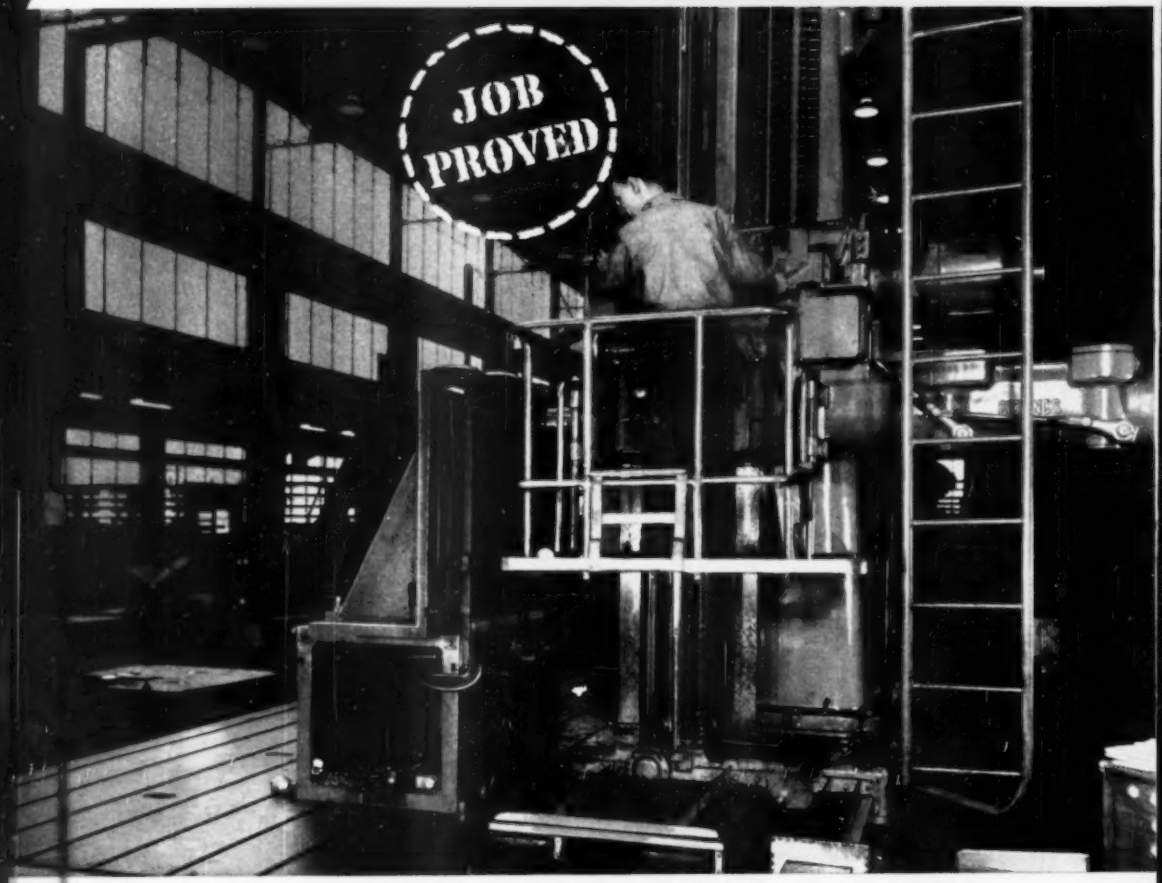
The equation as given applies specifically to steel with a tensile strength of 60,000 psi, but may be used for materials with other tensile strengths.

Example: Determine the horsepower required to drive a press punching 40 ½-in. holes per min. in a ¾-in. plate of 60,000-psi tensile strength.

Solution: Enter the left-hand side of the chart at 40 holes per min. and run across horizontally to the ½-in. diameter curve. From here drop vertically to the ¾-in. thickness curve, and then run across horizontally to 2.9 hp. If the tensile strength is greater or less than 60,000 psi, the problem is solved in the same way. The actual power required is approximately equal to:

$$\frac{\text{actual tensile strength}}{60{,}000} \times \text{chart horsepower}$$





ENDS CHATTER, JUMP, DOWNTIME

Sunoco Way Lubricant Gives Superb Results After Other Products Are Tried and Rejected

A machine tool manufacturer was having trouble milling and boring steel plates which weighed up to 30 tons. Jump and chatter marred the finish and impaired the accuracy of the work. Every six months the department had to shut down for refinishing of the ways. All this added up to loss of production and costly maintenance.

Oil after oil was tried as a way lubricant, but the trouble continued. Then, acting on the recommendation of a Sun Engineer who had been called in, the company decided to try Sunoco Way Lubricant. In more than a year of use, this product has prevented all chatter and jump. Ways are in excellent condition and the quality of the work meets the manufacturer's high standards. A substantial sum has been saved through the elimination of downtime for way refinishing.

Sunoco Way Lubricant has exceptional metal-wetting and adhesive properties, as well as ample lubricity and extreme-pressure characteristics. Sunoco Way Lubricant resists corrosion. In shop after shop, it is helping to improve finish, increase production, and reduce costs. For complete information about Sun "Job Proved" Products refined for the metalworking industry, call or write the nearest Sun Office. The services of a Sun Engineer are always available to you without obligation.

SUN OIL COMPANY · *Philadelphia 3, Pa.*
In Canada: Sun Oil Company, Ltd.
Toronto and Montreal

SUN PETROLEUM PRODUCTS
"JOB PROVED" IN EVERY INDUSTRY

SUNOCO

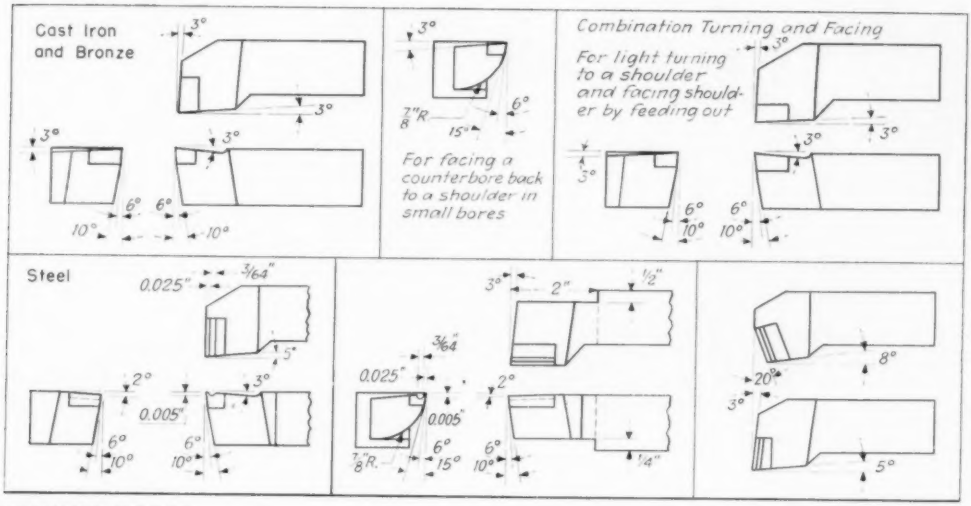
American Machinist

REFERENCE BOOK SHEET

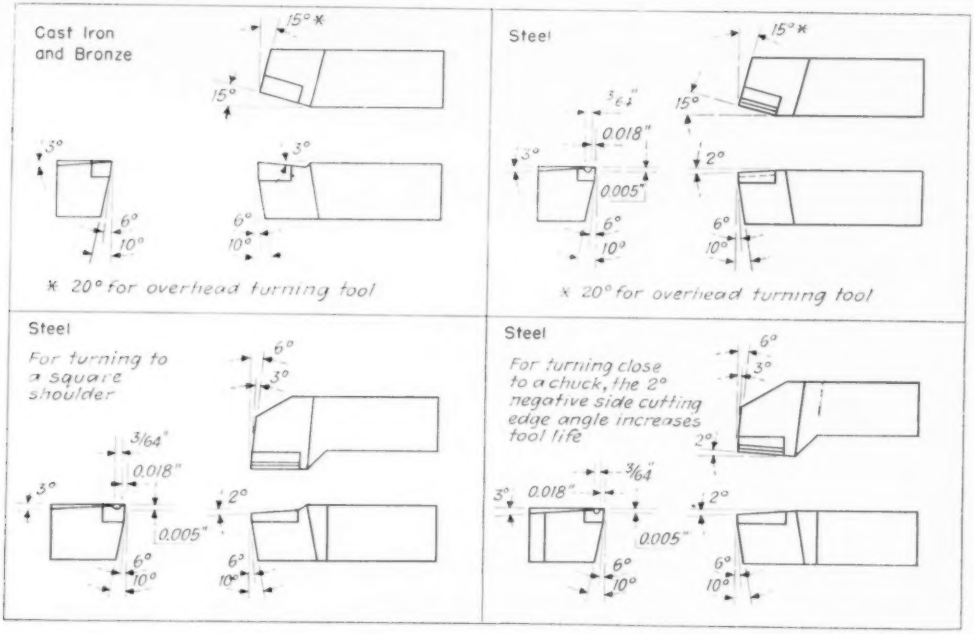
Carbide Turret-Lathe Tools

COURTESY METHODS DEPT., CLEVELAND AUTOMATIC MACHINE CO.

FACING TOOLS



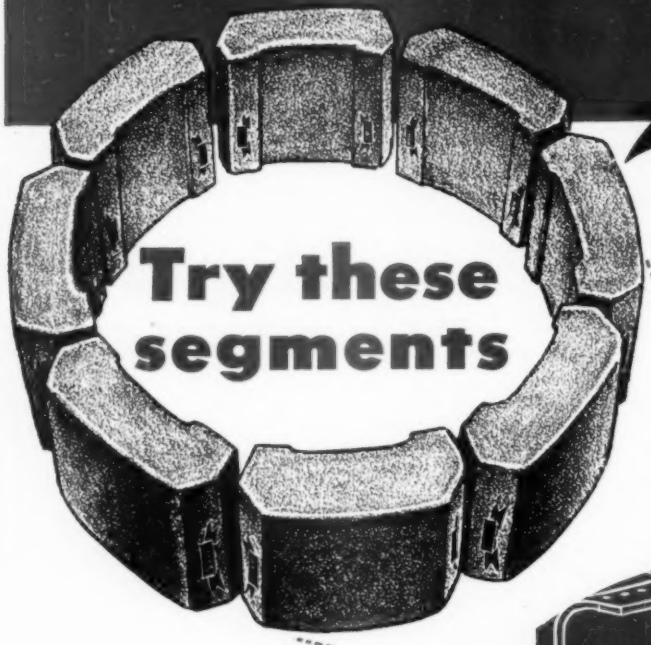
TURNING TOOLS

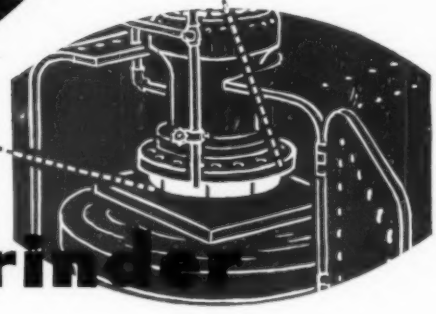


SIMONDS
ABRASIVE CO.
PHILADELPHIA, PA.

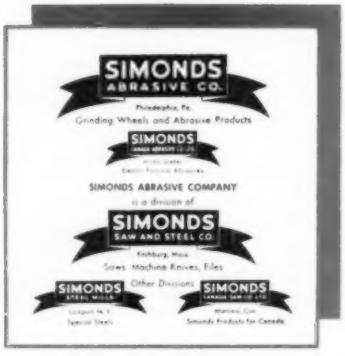
Grinding Wheels

Try these segments





on your surface grinder



For long life plus cool cutting . . . for economy and production efficiency in surfacing large areas or a number of small pieces together . . . use Simonds Abrasive Company Segments.

In all sizes to fit all types of segmental chucks, solid or gap type. Made from top quality raw materials processed by Simonds Abrasive under complete quality control. Available in Borolon (aluminum oxide) and Electrolon (silicon carbide).

Our complete line has everything for *all* your grinding needs . . . *all* your surfacing operations, vertical or horizontal. Data Book gives information on Segments, Straight Wheels, Cylinder or Ring Wheels and Cup Wheels. Also lists your distributor's name. Write.

SIMONDS ABRASIVE COMPANY, PHILADELPHIA 37, PA. DISTRIBUTORS IN PRINCIPAL CITIES

TALKING SHOP

Live Product

WE'VE ADDED engineering colleges to our Metalworking Inventory for the first time. We sent the standard blank, which goes to all manufacturers, and has a line for "Principal Product" and one for "Wage Earners." The first three questionnaires returned from colleges show "Students," "Educated Men," and "Engineers" as the principal product, but only one shows any wage earners. Maybe they lack confidence in their graduates—or are the hard times upon us?

For Want of a Nail

YOU MAY RECALL our remarks early this year about racing drivers and their preference for the beautifully finished over the highly accurate. A metallurgical engineer tells us now that Mauri Rose lost second—or perhaps first—place in the Indianapolis 500-mile race because he had stainless steel in an unsuitable application. He used an 18-8 strap to hold down the magneto. Under such conditions of vibration, stainless work-hardens and becomes brittle. The metallurgist says, "That's very probably why the strap cracked and released his magneto—and eliminated his car from the race. A tough, ductile, nickel steel strap wouldn't have looked so well, but it should be used for that service and appearance forgotten."

More Swaging

SWAGING is being applied to a number of jobs formerly done in other ways—such as tapering the ends of transformer cooler tubes, turnbuckles and sleeves in dimensions from ½ in. to 4 or 5 in. One turnbuckle job is in heavy-gage stainless steel, while a transformer tube is very light-gage carbon steel. Both jobs are done cold, then normalized. In another case, aluminum rods up to 9/16 in. in diameter and some 8 ft. long are tapered at both ends simultaneously to about 3/16 in. in an 8-head transfer-type machine. Swaging done by each of the four heads can be blended into a constant taper.

Turks Head

EVER HEAR of a turks head? There's the sailor's knot by that name, of course, but it's also the trade name for an adjustable drawplate. These plates, in which rolls are mounted, supplement the drawing die for shapes other than round. They're extensively used in the wire trade to draw rod to rectangular and special shapes. They have tool-steel rolls and work like a rolling mill. The material is rolled on both the horizontal and vertical planes simultaneously, usually by four rolls held in the head.

The plain type handles half-round, lozenge (or diamond), H and similar shapes. Each of the four rolls has its own adjusting screw, so fairly heavy reductions can be made. The universal type has only two adjusting screws, and is used for rectangular and keystone shapes. It is suitable for short runs of special shapes.

Work-Hardening

IN ONE aircraft installation, thread tips have been fracturing on stainless steel (18-8) bolts. Turns out the threads are rolled, and the consequent work-hardening is not relieved by subsequent stress-relieving. The maker is now planning to mill the threads, at greater cost but without the trouble from embrittlement. In the meantime, stainless nuts with a sulfur content are being tried. The regular bolt alloy contains selenium, and the sulfur-type alloy will not gall it.

Lubrication Too

IN OUR RECENT ACCOUNT of man's virtues as a machine (*A.M.*, May 5) we failed, according to John Homewood, to mention an extremely important one. Man, says John, is self-lubricating, too. Except when he gets old —when the lubrication must be externally applied.

Heart Warmer

WE TALKED to an engineer from IBM recently about a very new, and very economical, way of doing a difficult job—asking if the information could be published. His reply warmed our heart, particularly in the light of several recent cases in which permission to publish was withheld because "the competition might find out." What he said was: "Sure, go ahead; IBM has no secrets."

Neither do other companies, if the truth were known. Any successful production method gets *first* to competitors, then to the rest of the metalworking world.

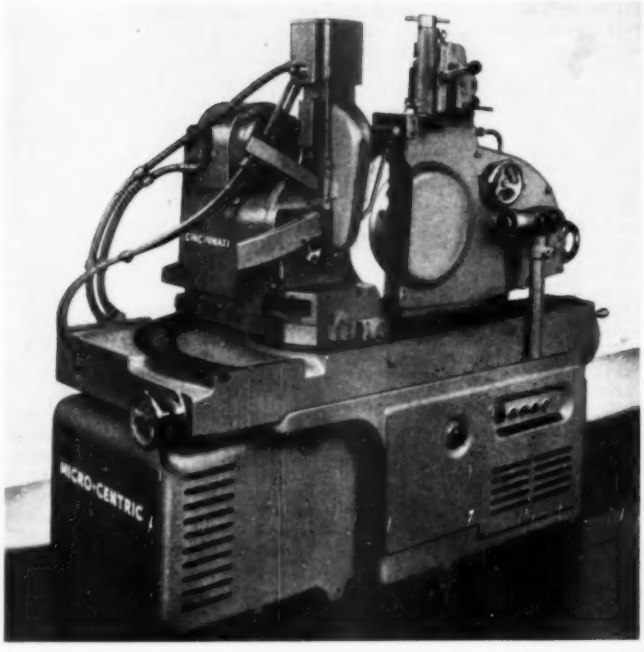
Hole, Not Drill

AS COSTS become really important, it behooves everyone concerned with management to maintain proper perspective—or in many cases, to attain it. As a friend of ours put it, "A man may buy a ¼-in. drill, but what he wants is a ¼-in. hole." There's always danger of confusing custom with efficiency.

Transfer Tool Setting

LATEST in transfer machines is a tool-setting method to cut down time. Each machine in the group has a bench with a surface plate and gages for setting all cutting tools. Behind this bench is a toolholder board with adequate spares for each station. The board is divided into colored sections for quick selection of the proper tool. The new transfer machine will produce 70 pieces per minute, has about 95 tools. The operator and his assistant will both be setup men, so if a tool breaks (which results in automatic stoppage) they can make a quick change. When all tools are set to gage, no adjustments are necessary when a tool is replaced.

New Shop Equipment



Cincinnati Micro-Centric Grinder Grinds OD Work by Infeed Methods

The Cincinnati Filmatic Nos. 1 and 2 Micro-Centric grinding machines are designed primarily for the manufacture of bearing races and other short parts ground to super-precise tolerances of roundness and squareness with one side. Employing a principle of work support and rotation, the machine will, without centers or a chuck, hold roundness under 0.000025 in. Work is located, rotated and supported so that the ground diameter can also be held square with a pre-finished face under 0.000025-in. accuracy.

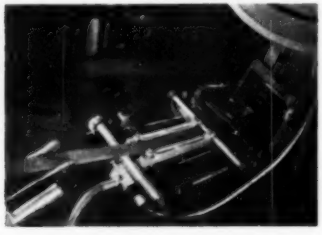
Grinders are made in two sizes Nos. 1 and 2 for automatic operation or for hand loading. No. 1 will grind work diameter from $\frac{3}{4}$ to $3\frac{1}{2}$ in. either automatic or hand loading, while No. 2 will handle pieces from 2- to 4-in. diameter, automatic loading, or 2- to 8-in. diameter when hand loading. Pieces above 4-in. diameter can be handled more efficiently with hand loading than the automatic loading. One operator can feed 2 to 4 automatic machines or 1 to 2 hand-loaded machines.

Grinders are built to handle work having a large diameter in relation to the length. The grinding-wheel head pivoting on a trunnion under wheel spindle is rocked forward into grinding position through a definite preset cycle. Cycle develops in four phases—load, rapid advance, feed and dwell, retraction and unload. Each phase can be individually controlled. Rapid advance movement, regardless of workpiece diameter, can be varied from 0 to $1\frac{3}{4}$ in. and the infeed movement can be varied from 0 to $\frac{3}{8}$ in.

Approximate setting of the wheelhead in forward position is accomplished by adjusting a locked cam at the rear of the unit which also serves as a positive stop for accuracy of repetitive sizing by limiting forward oscillation of the wheelhead. Final close-grinding adjustment is made by positioning cross-slide on which headstock is mounted. Depending on material to be ground and quality of finish required, combined infeed and tarry time can be varied by an electrical time-delay relay from 3 to 60 sec. Infeed rate of grinding can be varied from 0.005 ipm. to 1 ipm. Grinders are primarily infeed machines; no provision is made for traverse grinding.

Grinding wheel reciprocator is available for improving quality of finish where required. On standard machines, headstock and work holding fixture are mounted on a swivel-plate that can be adjusted through 90°. Radially trued or formed grinding wheels allow grinding peripheral shapes.

Cincinnati Milling and Grinding Machines, Inc., Cincinnati 9, Ohio

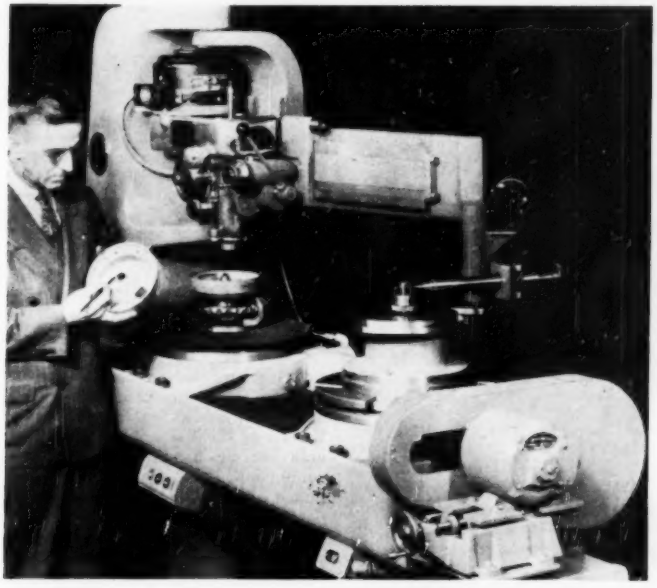


Automatic Air-Feed Unit Operates at 300 Strokes Per Min.

Feedmaster air-feed unit is designed to feed sheets, channels, bars, etc. in a wide range of thicknesses and widths. The unit weighs 50 lb and can be attached to punch presses, drillpresses, spot welders, etc., by drilling and tapping two holes in the edge of the bolster. Length of feed is adjustable to micrometer accuracy. Feed is adjustable while unit is in operation. Under normal shop air pressures, Feedmaster can be operated at 300 strokes per min. Maximum stock thickness is $\frac{1}{4}$ in. The Model F-3 takes maximum stock width of 8 in. Capacity can be increased to 15 in. with attachment.

Great Western Tools Inc., 3811 Riverside Drive, Burbank, Calif.

Materials and Parts



Gorton Contour Mill Profiles, Grooves Cams to Close Tolerances

This contour mill, No. CM-12, with rotary master, variable ratios, and automatic cycling, profiles or grooves either the inside or outside periphery as well as top of cams or cam-like shapes to extra close tolerances with high surface finishes. Basically it is a tracer-controlled swivel-head milling machine employing rotary tables and operating at reduction ratios from 2:1 to 10:1. Reduction ratios make possible its extreme accuracy.

Due to construction of machine, it can be modified to accommodate larger or smaller work. Mill profiles all conventional cam shapes which do not include negative angles. Most interrupted cam shapes which lend themselves to continuous cycle-profiling can also be accommodated. Two 16-in. roller-bearing rotary tables are mounted on the bed of the machines and are geared together and powered by an infinitely variable-speed unit providing required rpm. Cutter and tracer spindles are mounted as shown on the rugged tracer extension arm. Reduction ratios are set by moving the micrometer bracket to right or left on extension arm according to calibrations engraved on face. A leadscrew is provided for locating the worktable under the spindle in its various positions. Operations are automatic. Work shape is generated by master, and cutter is fed into the work at a fixed depth by the tracer-feed cam. Mill can also be furnished with automatic spindle feed.

Spindle speeds from 300 to 10,000 rpm are available permitting use of high-speed steel cutters, carbide cutters or burrs and grit grinding wheels. Workpiece diameters of machine illustrated at various reduction ratios are as follows: 2:1 = 8 in.; 4:1 = 4 in.; 6:1 = 2-2/3 in.; 8:1 = 2 in.; 10:1 = 1:6 in. Master copy table is 16 in. in diameter and will accommodate larger diameter master cams. If cam or work is thin, several can be profiled at once by stacking. Approximate size is 91x25x75 in. high.

The George Gorton Machine Co., Racine, Wis.

...INCLUDING

Utility shaper designed for carbide tools can cut at 250 fpm on 10-in. stroke.....page 148

High-speed multiple-turning lathe operates on rack-and-pinion feed principle permitting longer cuts than possible with cam-operated closed-cycle lathe.....page 149

Self-contained motorized bench press in capacities of 13, 15, 18, 20 tons .....page 152

Truck attachment handles fragile wood crates without pallets .....page 154

Pencil-size broach cuts 1/16-in. wide keyways to 0.07 in. deep.....page 156

Diamond abrasive compound stable from 150 to —50 F, suitable for machine lapping of carbides .....page 158

Measuring machine takes external, internal measurements, is graduated in inches, millimeters .....page 160

...and in July 28

Multiple swager combines eight swaging heads, transfer and trimming equipment for aluminum armor rods.

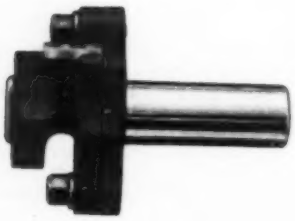
Precision boring machine operated with cams eliminates fluctuation.

Roll feeds have automatic starting and roll-release mechanism.

Cincinnati Utility Shapers Employ Carbide Tools

This improved utility model shaper offers the table supported directly on the cross rail without an apron, and is heavy enough to take the full load without table support. Construction adds to rigidity of the table by reducing overhang. Models are equipped with high speeds using carbide tools. Cutting speeds over 250 fpm are possible on a 10-in. stroke. Other features include automatic lubrication to all bearings, single-point taper gib adjustment, and others. Models are made in 16- and 20-in. stroke sizes and can be equipped with a 3- or 5-hp motor drive. An improved tool lifter is available as an extra.

The Cincinnati Shaper Co., Cincinnati 25, Ohio



Adjustable Pointing Tool Handles Right-, Left-Hand Jobs

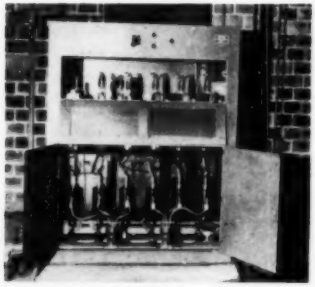
This universal adjustable pointing tool can be used for right- or left-hand jobs. Four setscrews bring in toolbit from right or left. Tool is adjustable to compensate for misalignment between turret and spindle. A special rectangular flat toolbit can be ground with four shapes which can be sharpened by taking a cut off the flat side, like a flat form tool.

Boyar-Schultz Corp., 2110 Walnut St., Chicago 12, Ill.

Line of Production Grinders Acquired by Mattison

Mattison Machine Works has purchased a line of production grinding machinery, formerly made by Hanchett Manufacturing Co. of Big Rapids, Mich. Machines will supplement the Mattison high-power precision surface grinder, the vertical-spindle way grinder for dovetails and undercuts, and the line of abrasive-belt grinding and polishing machines. Hanchett machines acquired include surface grinders, face grinders and disk grinders of various types.

Mattison Machine Works, Blackhawk Park Ave., Rockford, Ill.



Automatic Speed-Control Unit For Machinery Prime Movers

An electronic automatic speed-control unit for machinery prime movers offers increased efficiency. Known as the Varitronic Drive, the unit can be installed on existing equipment. It is essentially a simplified system for utilizing flexible performance characteristics of dc motors, but operating from an ac power source. It embraces either constant torque or constant hp, and control can be held within limits as close as 2% of basic speed.

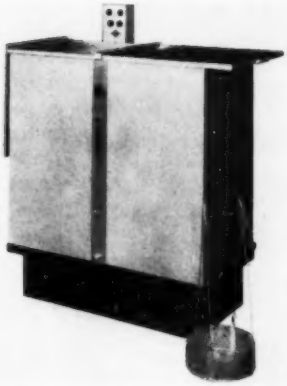
Use of the Varitronic Drive permits remote pushbutton control, dynamic braking, automatic reversing, inching, jogging, controlled acceleration and deceleration and control of input torque or hp. Motor and brush life are lengthened as drive is engineered for a specific power range. It is said to eliminate many transmissions, clutches, belts and bearings.

Electron Equipment Corp., South Pasadena, Calif.

Miller Swivels Available for Use with Strung Blocks

Twisting and kinking of wire lines in strung hoisting blocks is prevented with Miller angular-thrust ball-bearing swivels. Swivels combined with hooks permit turning loads independently. Complete assemblies are available combining swivel with various sizes of blocks and hooks, or the swivels can be inserted in blocks now in use. They are available in capacities handling to 23-ton loads with a safety factor of more than 5 to 1.

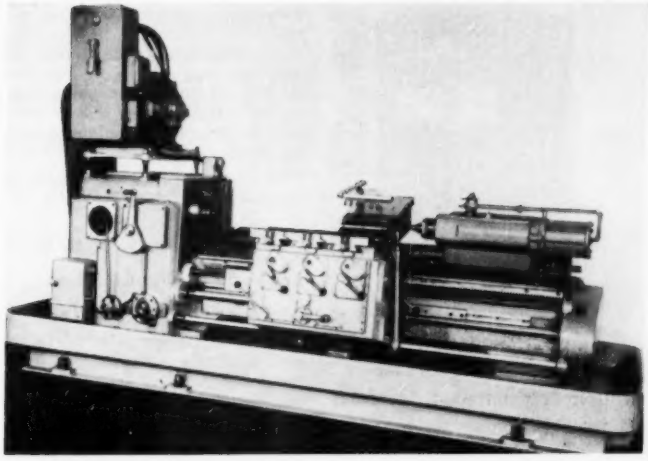
General Machine and Welding Works, Pomona, Calif.



Automatic Stainless Degreasers Have Hot-Vapor and Dip Tanks

This automatic stainless-steel Circo Twin-Tank degreaser is electrically heated and thermostatically controlled. A stainless-steel hot-vapor tank is provided for automatic vapor degreasing measuring 18x18x32½ in. A galvanized-steel dip tank of the same dimensions is furnished for flushing, dipping and soaking parts to be cleaned. Hot-vapor tank takes 5 gal. of non-explosive and nonflammable Per-Solv solvent which is vaporized by heat. Indicator light shows operating conditions at all times. Dipping and flushing tank takes approximately 20 gal. of solvent.

Circo Products Co., 12117 Berea Road, Cleveland 11, Ohio



High-Speed Multiple Turning Lathe Suited for Shaft Work

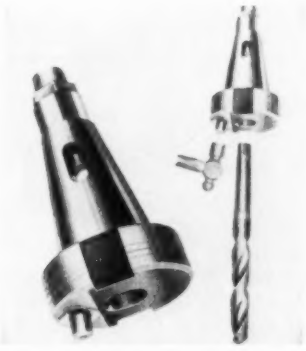
Model AP high-speed multiple turning lathe with unlimited carriage travel is especially suited for shaft work. The multiple-slide front turning carriage operates on the rack-and-pinion feed principle permitting longer cuts than possible with cam-operated closed-cycle lathes.

The semi-automatic lathe permits heavy stock removal with sintered carbide tools, possible because of the balanced twin-rack pinions meshing with heat-treated steel racks, cutting the units tooth pressures in half. Lathe handles shaft work involving long shoulder lengths where overlapping of cuts is not desirable. It is also desirable for short-run jobs.

Carriage cross-slides are power operated and individually controlled. Hinged-type roller steadyrests prevent work from springing away from the tools. An automatic feed throwout coupled with automatic tool relief, and a safety feed clutch are included.

Seneca Falls Machine Co., Seneca Falls, N. Y.

TELESCOPE TRUCK permits steering 48x48-in. pallets to ceiling from 6-ft. aisles. Model 6-48 telescopic straddle-type high-lift truck has 115-in. lift. Capacity is 2500 lb, collapsed heights, 68 and 83 in.—*Revolvator Co., North Bergen, N. J.*



Adapter for Milling Machines Facilitates Tool Changes

This Harding rotary adapter for milling machines is offered for quick change of tools. Tools are ejected by tapping the release button located on face of adapter. Ejection is by built-in hydraulic force. Adapter will fit any milling-machine spindle. Unit holds any tool having a Morse taper shank. Other holders can be secured for special tapers either inside or out, or both. At present holders are manufactured in both No. 40 and 50.

Greenville Tool and Die Co., Greenville, Mich.

Water-Wash Compound for Paint Booths Lubricates Overspray

A water-wash compound for paint spray booths lubricates the overspray. Identified as Northwest No. 1, it coats each particle of paint with a non-volatile solvent. Sludge remains floating for easy skimming.

Northwest Chemical Co., 9310 Roselawn Ave., Detroit 4, Mich.

Time-Temperature Controller Utilizes Predetermined Schedules

Controlling temperature by predetermined schedules is done with the Model CPR time-temperature program controller. Instrument is 9x18x8 in. deep and is designed for flush or surface mounting. Upper section contains a modified Model C Veri-Tron electronic controller, having plug-in compartmented construction. Lower compartment contains synchronous motor-driven cam which by means of a backlash free linkage, positions control index arm automatically as called for by cam contour.

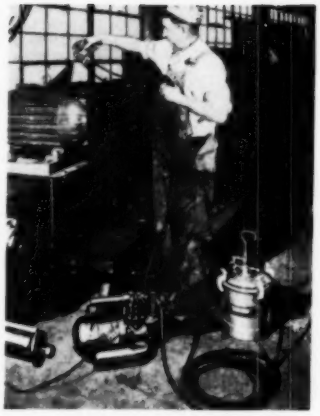
A full gasketed glazed cover permits observing cam or cycle position at all times. Variety of standard and special scales ranging from —300 F to 3400 F or centigrade equivalent are available.

Taco West Corp., 515 N. Noble St., Chicago 22, Ill., Dept. W.

Automatic Gas-Fired Machine Attaches Ribs to Tapered Tubes

Ventilated ribs are attached to tapered steel tubes with thirteen simultaneous silver-alloy brazings on each by an automatic gas-fired machine. Forty brazed and visually-straight tubes are delivered per hr on the machine equipped with six high-velocity, superheat burners and 24 open-flame burners. The burner system, controlled automatically to give required heat input and time, is positioned for an exact brazing-heat pattern. The machine, 6x2½x1¾ ft, consumes 390 cu ft of 530 Btu gas per hr.

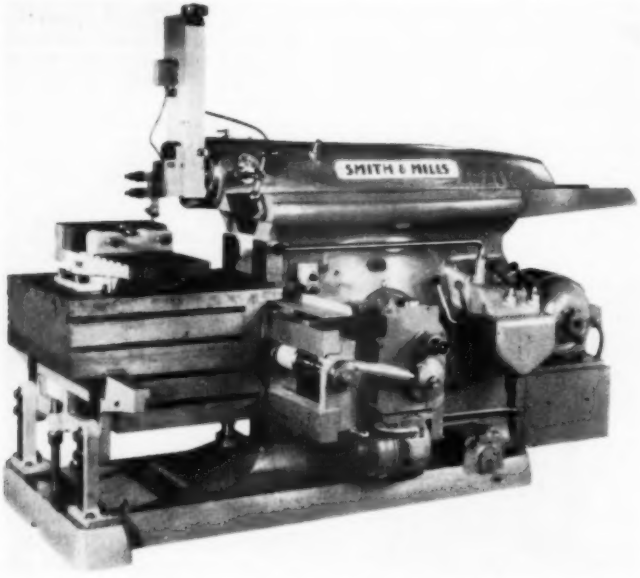
Selas Corp. of America, Erie Ave. and D Street, Philadelphia 34, Pa.



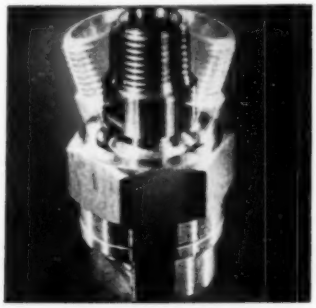
Portable Paint Spray Unit Weighs 47 lb, Delivers 1 hp

Lightweight portable Binks DP paint spray unit weighs 47 lb and delivers 1 hp. It handles enamels, lacquer, shellacs, varnishes, etc. The DP (meaning direct-drive piston) portable paint spray delivers 40-lb working pressure in ample volume to operate Binks standard spray guns. It plugs into any 110-120 vac line. Compressor is 15⅞x11½x7½ in. wide.

Binks Mfg. Co., 3122 Carroll Ave., Chicago 12, Ill.



SPECIAL 32-IN. SHAPER was built to shape top and recess both ends of a large semi-steel casting with one set-up. Shaper offers a maximum table travel of 40 in.; table width, 30 in.; maximum clearance under ram, 26½ in.; maximum travel of the tool slide 19 in. Shaper features horizontal power rapid traverse, power electation to table, automatic vertical feed, automatic tool lifter, manual tool lifter for recessing tools—*Smith & Mills Co., Div. Hamilton-Thomas Corp., Cincinnati 25, Ohio*



Swivel-Ball-Joint Coupling Will Turn 20° in Any Direction

Universal swivel-ball-joint coupling for pipe or hose is leakproof and vibration proof. It will turn 20° in any direction with no restriction of flow regardless of angle. An O-ring provides a seal against leakage at any pressure. The standard ⅜-in. Kelite swivel - ball joint handles pressures from ¼ oz to 150 psi and temperatures to 350 F. Models for any size pipe and for higher pressures and temperatures are available.

Kelite Products, Inc., Box 2917, Terminal Annex, Los Angeles 54, Calif.

OUTDOOR FURNITURE MAKERS
Can Relax and Rest Easy

...when their costs are fastened down ... and sales speeded up ... by AMERICAN PHILLIPS SCREWS

VACATION FROM COST-WORRY: Assembly costs are controlled ... *fixed and held as much as 50% lower than you ever saw them before* ... when old-fashioned slotted screws are replaced by modern, power-driven American Phillips Screws, the *only* screws with the crossed, *cornerless* recess. Production and product-quality go up as worker-fatigue goes down. And profits flourish as rejects and spoilage all but vanish.

VACATION FROM SALES-WORRY: Customers *don't* like bungled fastenings with ugly, marred surfaces and broken screw-heads that snag clothes. And that's exactly why they *do* like American Phillips-fastened products ... because every fastening is cleanly made and attractive to look at, with never a burred head to spoil sales-appeal. So fasten *your* product with American Phillips Screws ... *and help yourself to double profits.*

4-WINGED DRIVER CAN'T SLIP OUT OF PHILLIPS TAPERED RECESS

AMERICAN SCREW COMPANY, PROVIDENCE 1, RHODE ISLAND
Chicago 11: 589 E. Illinois St. *Detroit 2:* 502 Stephenson Building

AMERICAN PHILLIPS *Screws*

ALL TYPES
ALL METALS: Steel, Brass, Bronze, Stainless Steel, Aluminum, Monel, Everdur (silicon bronze)

Sloped Bottom Box and Stand Simplifies Small Parts Handling

Sloped bottom box and stand simplifies small parts handling with reduced labor costs. Operation is controlled by lever located on the box. Release permits parts to slide down to a waist-high tray on stand. Box is of all-steel construction and is equipped with crane lugs for pick-up and carry.

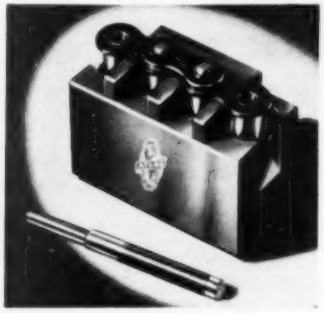
Palmer-Shile Co., 16019 Fullerton Ave., Detroit 27, Mich.

Motorized Hydraulic Bench Press By Munton Is Self-Contained

Self-contained motorized hydraulic bench press, type FM, is available in 5-, 13-, 18-, and 20-ton capacities. Press has a 3-hp, 220-440 v, 3-phase 60-cycle motor, hydraulic pump, valves and piping, all inclosed in housing of unit. Lever actuates and releases hydraulic ram. Hydraulic ram is mounted on a chromium-plated piston which travels on a steel cylinder.

Ram has a stroke of 9 in. Down-stroke is 100 ipm and return travel is 125 ipm on the 5-ton press. Distance from ram to platen is 10¾ in. Platen is 10x16 in. Over-all dimensions are 53x14x40 in. deep.

Munton Mfg. Co., Franklin Park, Ill.



Repair Set for Roller Chain By Atlas Prevents Binding

This chain tool facilitates chain repair and prevents binding. It consists of an anvil, a fork and a punch. To disassemble the chain, prongs of the fork are inserted between the side plates of chain so as to span the two rollers containing the pins to be removed. The fork and chain are then laid in a slot of the anvil which is milled to the contours of the chain so that slippage cannot occur. In this position chain is suspended on the fork and the pins can be removed by striking each one alternately until driven through the links. Tool is available in sizes to fit any standard roller chain.

Atlas Chain & Mfg. Co., Castor and Kensington Ave., Philadelphia 24, Pa.

Non-Silicated Cleaner Applicable To Steel, Copper, Brass, Others

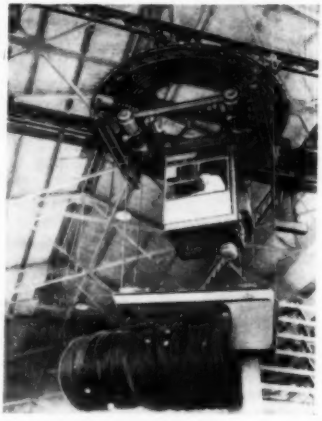
Cleaner, Matawan No. 25W, is a non-silicated soak or electro-cleaner for application where the presence of a silicate in the solution would interfere with subsequent processing. Matawan No. 25-W may be used as a soak or electro-cleaner on steel, copper, brass, lead-base castings or die castings. Reverse electro-cleaning may be used on steel to secure smut-free surfaces. The concentration recommended is 3 to 8 oz per gal. The higher concentrations are recommended for steel. Temperature range is 160 to 200 F. Immersion time for soak cleaning is 3 to 5 min. Immersion time for electro-cleaning is 30 sec to 3 min.

Hanson-Van Winkle-Munning Co., Matawan, N. J.

Vibration Integrator, Pickup Enables Displacement Measurement

Type 410-X6 vibration integrator and Type 410-X6 calibrated vibration pickup enable measurement of vibration displacement, velocity, and acceleration in the audio-frequency range. Displacement can be measured from 0.14 mi in. to 0.028 in.; velocity from 51.3 mi in. per sec to 10.3 in. per sec; and acceleration from 0.15 in. per sec per sec to 3900 in. per sec per sec over a frequency range of 25 to 3000 cycles. Response is flat from 60 to 1000 cycles. Operation requires the vibration integrator to be inserted in place of the microphone on the sound level master. Vibration pick-up is held in the hand while readings are taken from the sound level master held in the other hand.

Herman Hosmer Scott, Inc., 385 Putnam Ave., Cambridge 39, Mass.



ROTATING CARRIER has five travel motions: hoisting, tilting, trolley travel, bridge travel, and rotation. Speeds of equipment are: bridge 400 fpm, trolley 200 fpm, hoist 50 to 80 fpm, and rotation 75 fpm. Carrier was designed to pick up coils of rods from incoming railroad cars and turn them 90° for placement into storage bins— *Cleveland Tramrail Div., Cleveland Crane & Engineering Co., Wickliffe, Ohio*

Cut Broach Sharpening Time 25% with

"STEP-STOP" MICRO-FEED

ON THE NEW *Colonial* UNIVERSAL BROACH SHARPENER

In sharpening a round broach on this Universal sharpener, the wheel is brought to depth on the first tooth. The "Step-Stop" slide is locked. The operator shifts to the next tooth and brings the wheel to full depth—to a definite stop. To his right is a micro-feed wheel with which he increases depth an amount equal to the step of the tooth. When the next tooth is ground the "Step-Stop" lets the wheel come in to this increased depth before hand-feeding with the micro-feed is required.

Where the step-per-tooth is small, the operator frequently can grind 3 or 4 teeth without using any hand feed—he just brings the wheel up against the stop each time.

Ask for Bulletin No. S-48-2

This is just one of the features of the new Colonial Universal Broach Sharpener shown here. Others include: New center-point steady rests for quicker setup; Low-inertia head; Dual head-slide handles to make both round and flat broach grinding as easy as possible for the operator . . . and all the other features which make Colonial's 1949 sharpeners "tops" for accuracy and speed.

PIONEERS OF H.S.S. BROACHING

COLONIAL

BROACH CO. DETROIT 13

Portable Transfer Unit Utilized for Filtration of Fluids

This portable transfer unit can be used for filtration of fluids. Mounted on truck with an electrically driven pump are a metal-edged strainer and micronic-type filters. Valves are so arranged that either one, both, or neither of the filters can be used. Model illustrated has a 20-gpm capacity. Others are available with 5-, 10-, 15-, 20-, 40-, 50- and 80-gpm capacities. Units can be supplied with suction and discharge hose assemblies.

J. N. Fauver Co., 49 W. Hancock Ave., Detroit 1, Mich.

Toolpost Bolts for Screw Machines Are Made in Three Sizes

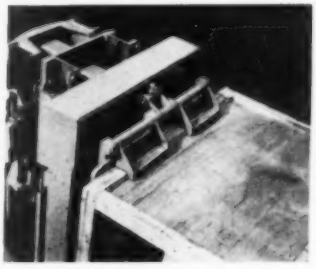
Toolpost bolts for automatic screw machines are made in three sizes: $\frac{3}{8}$ for No. 00, 7/16 for No. 0 and $\frac{1}{2}$ for No. 2 size screw machines. Bolts are made from high-grade alloy steel heat-treated for maximum properties. Nuts are made to assure Class 3 fit.

Boyar-Schultz Corp., 2110 Walnut St., Chicago 12, Ill.

Type X-6 Silicone Rubber For Low-Temperature Applications

X-6 silicone rubber for low-temperature applications can now be furnished in gaskets, diaphragms, sleeves, packings, channels, and other molded, extruded, punched, and die- or lathe-cut rubber parts. Parts are recommended for applications involving continuous temperatures as low as —110 F. Tests indicate that X-6 is resistant to sulfur dioxide, liquid ammonia, and certain types of Freon used in refrigeration systems.

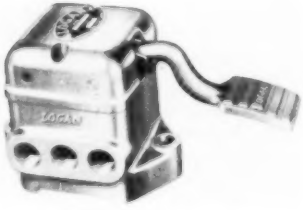
The Stalwart Rubber Co., 218 Northfield Road, Bedford, Ohio



Truck Attachment Handles Fragile Wood Crates Without Pallets

Attachment handles fragile wood crates which are lifted by the edge. Notched design permits handling crates of varied sizes in vertical or horizontal position. Attachment for use on Skylift electric trucks eliminates pallets in storage and shipment. Using a clamp device instead of forks, it grips the end slats of the boxes. After grabbing edge, load is lifted, carried and tiered as in a standard materials-handling operation.

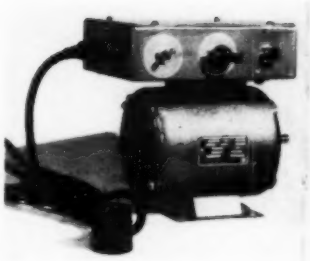
Automatic Transportation Co., 149 W. 87th St., Chicago, Ill.



Foot-Operated Control Valve Designed for Pressures to 150 psi

This Model 6552 foot-operated, four-way control valve is built in three sizes, $\frac{3}{8}$-, $\frac{3}{4}$- and 1-in. port sizes and is designed for pressures to 150 psi. It is compact to permit installation in limited space. Self-cleaning construction keeps cups free from dirt. Valve cover may be rotated 90° or 180° to simplify piping problems.

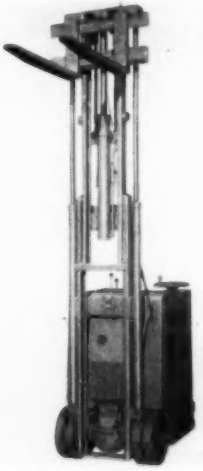
Logansport Machine Co., Inc., Logansport, Ind.



Hysteresis-Type Synchronous Motor Provides Three Speeds

Elinco Model GH-371, a three-speed Hysteresis-type synchronous motor, is rated at 1/100, 1/60, and 1/40 hp, respectively at 900, 1800 and 3600 rpm. Offered for both production and laboratory work, operation is switch controlled or relay controlled, providing for clockwise or counter-clockwise rotation. It is reversible while running and can change from one speed forward to a different speed reverse. The motor operates on 115-v, 60-cycle, single-phase, ac. Dimensions are $4\frac{5}{8}$ in. diameter and $5\frac{7}{8}$ in. in length, excluding shaft. The model can be furnished with control box wired, and ready to use at $80.

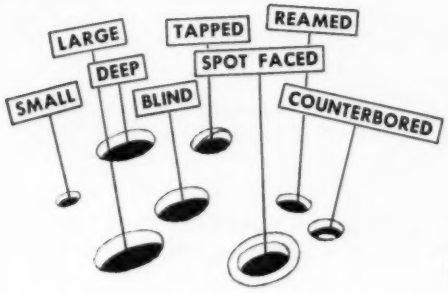
Electric Indicator Company, Stamford, Conn.

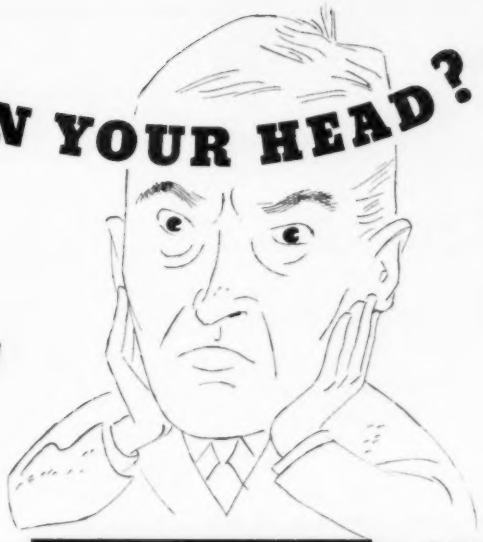


ELECTRIC FORK TRUCK has maximum lift of 120 in. Crescent Aisle Saver with a 2000-lb capacity has free initial lift of 63½ in. Truck is equipped with an 83-in. collapsible mast incorporating auxiliary twin-cylinder hydraulic lifting unit. Standard tilt is 5° back and 3° forward—*Crescent Truck Co., Lebanon, Pa.*

PRECISION

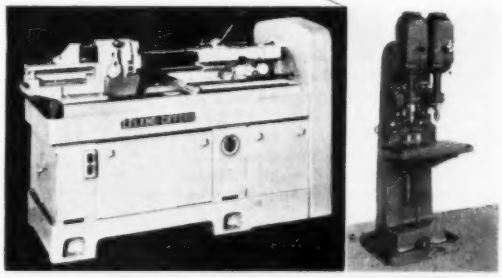
GOT HOLES IN YOUR HEAD?

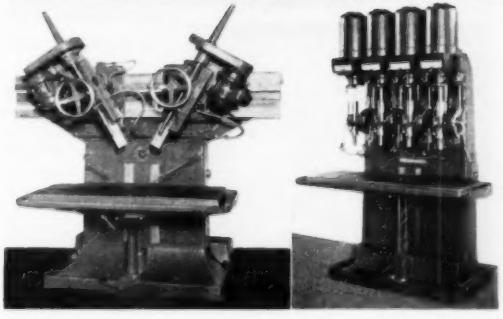




LET LELAND-GIFFORD HELP YOU GET DRILLING PROBLEMS OFF YOUR MIND

Leland-Gifford offers you a wealth of knowledge and experience, unsurpassed technical assistance, on-the-spot engineering service, the facilities of the Country's largest manufacturer of sensitive drills . . . *plus* a complete line of motor spindle drilling machines with new and exclusive features for low cost, mass production drilling of precision holes. Look to Leland-Gifford for the one best method and machine for every drilling need.





THE LELAND-GIFFORD LINE

A Precision Machine For Every Production Drilling Operation

- High Speed Super Sensitive
- Light, Medium or Heavy Duty
- Single or Multiple Spindles
- Hand, Power or Hydraulic Feed
- Vertical, Horizontal, Angular or Universally Adjustable Deep Hole Drilling Machines
- Standard or tooled to meet your special needs

PRODUCTION MEN

Get This Handy Slide Rule

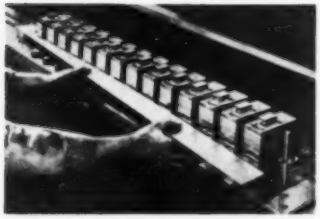
A valuable aid in figuring costs and setting production schedules. Quickly gives time required to drill holes of any size and depth in any material. It's free. Write the nearest office.

LELAND-GIFFORD

Drilling Machines

WORCESTER 1, MASSACHUSETTS, U.S.A.

- CHICAGO 6, ILL. 565 W. Washington Blvd.
- DETROIT 26, MICH. 1533 Dime Bank Bldg.
- CLEVELAND 1, OHIO P. O. Box 5547
- NEWARK 2, N. J. Industrial Office Bldg.
- ROCHESTER 1, N.Y. Commerce Bldg.
- LOS ANGELES 14, CAL. 724 South Spring Street



Wales Louver Notching Unit Features Self-Contained Holder

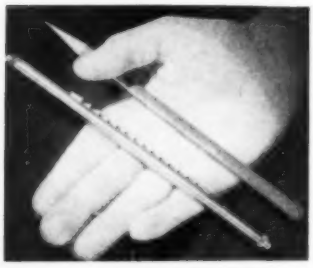
These louver notching units are used in notching long slits in fluorescent-fixture louvers. Self-contained design permits reuse of unit in unlimited setups in press brakes and stamping presses. Plungers are not attached to the press ram.

Wales Strippit Corp., North Tonawanda, N. Y.

Deburring, Finishing Barrel Offers Speeds from 6 to 30 rpm

This deburring and finishing barrel Model DB-200 offers variable speeds from 6 to 30 rpm. Safety is assured with a roll-away perforated hood, permitting positioning of barrel with hood down. A positive magnetic break allows inching barrel into position. Doors are cam-operated for quicker opening and closing. Model is available with neoprene lining or unlined.

Almco Div., Queen Stove Works, Inc., Albert Lea, Minn.



Pencil-Size Broach Cuts 1/16-in. Wide Keyways to 0.07 in. Deep

This pencil-size broach is capable of cutting 1/16-in. wide keyways to 0.07 in. deep. The pencil-size Glenny broach features protected blade, chatter elimination, absolute centering, and rapid keyway cutting. Cutting blade has a Rockwell hardness of 63 to 65 on the C scale.

The Kase Machine Co., 18422 Buffalo Ave., Cleveland 19, Ohio

Motor-Sleeve Bearings Replaced in One Operation

Worn sleeve bearings can be replaced in one operation with this tool consisting of a steel rod, finished to accommodate precision bored bearings on one end, and unbored bearings for undersize shafts on the other. A central shoulder separates the two ends.

New bearing is slipped on rod, its unchamfered end against the shoulder of tool. A spacer, furnished with the tool, is slipped on with its unchamfered end against the new bearing. The end of tool is then inserted in the old bearing from the inner side of the endplate. A press or a rawhide mallet is then used to drive the tool until its shoulder seats against the endplate. Spacer forces out the old bearing, and new bearing forces out spacer. Tool is available in four sizes for motors with finished bearing sizes of 0.655, 0.751 0.812, and 1.062 in.

Wagner Electric Corp., 6489 Plymouth Ave., St. Louis 14, Mo.

Lightweight 8-in. Grinder Is Portable, Air Powered

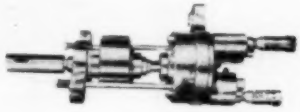
This air-powered portable 8-in. grinder has magnesium castings for lightness and a steel housing for protection. Tool weighs 14 lb. Speed is governor-controlled whether idling or under heavy load. An oil reservoir is built in for air lubrication. Grinders are available in spade and straight handle models, 6- and 8-in. sizes, with selected range of speeds including 4200, 4500 and 6000 rpm. All models have 5/8-in.x11 spindle thread. Tools are furnished with a choice of grinding wheel or wire brush.

The Aro Equipment Corporation, Bryan, Ohio

Model 10 Lighting Fixture Gives Cool, Glare-Free Illumination

Model 10 Miniature fluorescent lighting fixture provides an intense but cool and glare-free illumination for critical work areas. Wide choice of support-arm lengths and arrangements are available. Design produces a light intensity of 550 foot-candles at a 3-in. working distance from two 4-watt fluorescent lamps. Fixtures are equipped with two lamps producing white (4500 K) light. Other colors are available. Lamps for emission of ultra-violet can also be supplied. Fixtures operate on 115 v, 60 cycles, 220 v, 60 cycles, 220 v, 50 cycles, and 110 v dc.

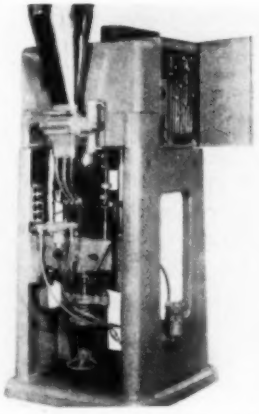
Stocker and Yale, Marblehead, Mass.



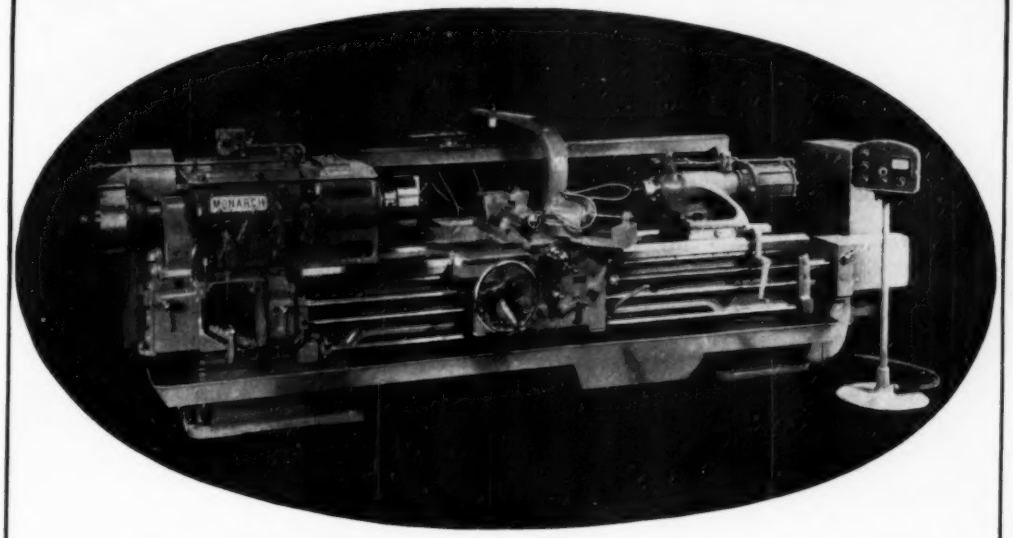
Tapping Head Permits Wide Adjustment Without Overhang

This adjustable tapping head permits wide range of adjustment without overhang. It is fully geared with needle bearings on all spindles and heads and ball-thrust bearings throughout. All parts are inclosed for pressure lubrication and protection. The tapping head is supplied with three spindles for equal adjustment in line and 3, 4, 5, or 6 spindles for equal adjustment on bolt circles.

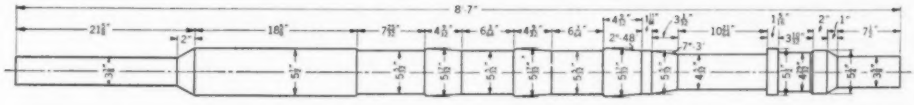
Errington Mechanical Laboratory, Inc., Staten Island 4, N.Y.



ALKYD-RESIN PRESS is designed for molding fast-curing alkyd resins. Automatic press Model 200-H features high-speed ram travel and is claimed to increase output 450% in a high production automotive part. Three cycles are completed per min—*F. J. Stokes Machine Co., 5900 Tabor Road, Philadelphia 20, Pennsylvania*



FIVE HOURS FIFTY-EIGHT MINUTES FASTER!



With Monarch's single-tool Air-Gage Tracing, this long shaft is turned complete in two hours 20 minutes. *Multiple-tool machining of the same part required eight hours 18 minutes.*

Note particularly the tough metal—the depth of cut—the 103-inch length. Air-Gage Tracing takes all these in stride. Moreover, it is equally applicable to the turning of multiple-diameter shafts or to the turning, boring and facing of contours to meet almost every practical application need. Nor does size of workpiece present any limitation—as witness the job illustrated.

Both an automatic machining cycle and automatic sizing are provided by the exclusive Monarch "Air-Gage Tracer". Speed and accuracy are inherent features; the motion of the cutting tool is controlled by a tracer mechanism operating directly on a master template or a master workpiece. Its air-gage-like action gives precision results never before attainable on tracer-controlled machines. Finish is improved, setup time minimized and tooling costs greatly reduced by this unique Monarch single-point cutting method.

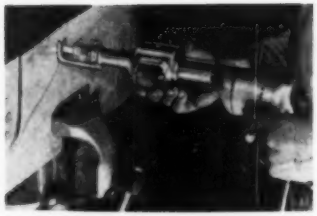
A constantly growing list of our customers is finding the way to reduced costs and improved quality through Air-Gage Tracing. May we show you how it will provide "peak production at a profit" in your shop?

JOB FACTS

Part—Extruder Shaft
Material—SAE 4150 heat-treated
Hardness—320 Brinell
Operations Performed—turn complete
Maximum Cut Depth—¾"
Cutting Tool—Cemented Carbide
Machining Time—2 hours 20 minutes
Machine—20" x 144" Monarch Model M Engine Lathe, Air-Gage Tracer-Equipped

ACCURACY · ECONOMY · LONG LIFE
Monarch
TURNING MACHINES

MONARCH MACHINE TOOL CO. • • • Sidney, Ohio



Portable Power Saw and File Attaches to Drill, Flexible Shaft

This Key-hak portable power saw and file will do any of the work of the keyhole saw and the hacksaw. Tool is attached to electric or air drill or motor-driven flexible shaft of either ¼- or 5/16-in. Jacob's chuck capacity. The unit is furnished in triple-chrome plate, weighs less than 4 lb, and is 11½ in. long. Tool cuts through all metals including plate stock, and is said to leave a clean burr-free finish without bending or stretching material.

Producers and Distributors, Inc., 4015 MacArthur Blvd., Oakland 19, Calif.

MSA Faceshield Protects Against Heat, Flying Particles

Faceshield protects against heat, flying particles - acid splashes, etc. The MSA Deluxe faceshield consists of a 19x9-in. visor of nonflammable vinyl plastic which extends completely around the face covering ears and extending below the chin. It is available in thicknesses of 0.020, 0.040, and 0.060 in. Visor is snap-fastened to a hard fiber sparkguard which shields the forehead and covers entire forepart of head.

Mine Safety Appliances Co., Braddock, Thomas and Meade Streets, Pittsburgh 8, Pa.

Combined Loader, Carrier, Truck Operates at Speeds to 30 mph

The low travel loader is a combination loader, carrier and motor truck. It self - loads from the side onto the carrying deck and then transports its load through narrow aisles or over-the-road. The travel loader operates at speeds up to 30 mph. Three models are available: a 3000-lb, 10,000-lb, and a 30,000-lb lifting capacity. Featuring four-wheel drive, full hydraulic control, and hydraulic loader operation, the travel loader can handle heavy, lengthy materials.

Lull Mfg. Co., 3612 E. 4th St., Minneapolis 6, Minn.

Diamond Abrasive Compound Permits Machine Lapping

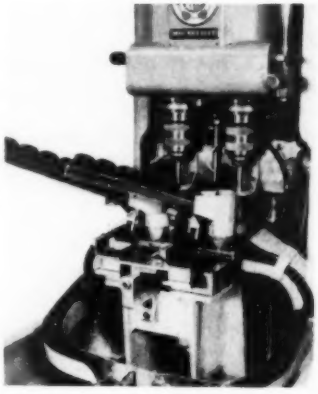
This diamond abrasive compound resists caking or drying out, is soluble in commercial solvents and water and leaves no dulling film on finished surfaces. Range of temperature stability is from 150 to —50 F permitting machine lapping with diamond abrasives. Typical uses includes finishing carbide in hardened and steel parts, plastic molds, drawing dies, etc. Precise size grading of the actual diamond particles is featured.

Industrial Products Div., Elgin National Watch Co., Aurora, Ill.

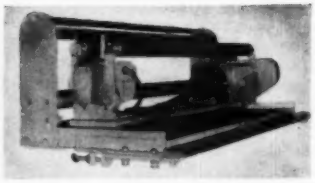
One-Split Bus Design for Feed-In Duct Reduces Voltage Drop

One-split bus design for feed-in duct reduces voltage drop in the distribution of power over long distances. The one-split bus design with halves positioned on either side of the other two buses separated by insulator plates permits close spacing and electrical symmetry important to reduction of both energy loss and voltage drop. Feed-in duct is available in 1200-, 1600-, 2000-, 3000- and 4000-amp ratings.

Square D Co., 6060 Rivard St., Detroit 11, Mich.



DOUBLE-SPINDLE MACHINE is a multiple-spindle Hydrohoner, equipped with Microsize automatic sizing. Operation of machine is automatic. Hardened gears are fed into a magazine, then automatically dropped into position in fixture, honed, and ejected. Production is 300 finished gears per hr. Size is held to less than 0.0003-in. tolerance by electronic Microsize control.—*Microhone Corp., Detroit, Mich.*



Greer Automatic Belt Guider Holds Conveyor Belts on Center

Light canvas or coated fabric conveyor belts are held on center or moved back to center if out of line by application of the improved Greer automatic belt guider. Installation is on loading end of conveyor on the return run slack side of belt. The unit is available in 13 sizes for belts from 24 to 48 in. wide. The 1/50-hp reversing motor is controlled by a double-throw switch actuated by feeler arm D which anticipates the belt "wanderlust." Side movement of the belt in either direction will actuate the switches and cause the motor to move one of the rolls out of line in correcting direction.

J. W. Greer Co., Cambridge 39, Mass.

Hand-Operated Auxiliary Permits Moving Long, Heavy Loads

Long, heavy crates, and bulky objects to 30 ft long are moved by this auxiliary lifting and rolling device. Utilized with the Elwell-Parker fork trucks, it handles loads to 8000 lb. The Rol-A-Lift is built in four models, all hand-operated. The heavy-duty size for loads to 8000 lb is 43 in. high, weighs 200 lb. It has a pair of forks 5 in. long, 16 in. apart; and a pair of swivel-type wheels 5 in. in diameter. A hydraulic lift jacket is mounted on the steel frame. Operator pushes forks under the forward end of the load and lifts it by means of the jack to 9½ in. max, after the power fork truck has engaged the opposite end of load.

Elwell-Parker Electric Co., 4205 St. Clair Ave., Cleveland 14, Ohio

Redesigned Battery Charger Offers Automatic Operation

This redesigned Type S single-circuit battery charger services batteries of industrial electric trucks. No manual attention is required during the charge. Charger shuts down completely when batteries are recharged. The Type S is made in 16 ratings to service the most popular size of lead and Edison batteries.

Electric Products Co., 1725 Clarkstone Rd., Cleveland 12, Ohio

How the base metal protects the finish

Progressive steps in the production of this emblem in red, white, blue, black and gold vitreous enamel and heavy gold plate, as made by American Emblem Company, Utica, N. Y.

(1) The metal is blanked from sheet stock. (2) First coining operation. (3) Second coining operation. (4) The excess metal is trimmed. (5) Attaching devices are welded. (6) First vitreous enamel charge has been fused by firing. (7) Second vitreous enamel charge has been fused by firing. (8) The enamel colors are stoned smooth. (9) Enamel has been given a final fusing and buffing. (10) The plate is electro gold plated.

(1A) The metal is blanked from sheet stock. (2A) The design is coined. (3A) The excess metal is trimmed and holes pierced. (4A) Attaching studs are welded. (5A) The plate is buffed and chrome plated. (11) The two pieces are assembled. (12) Finished plate as passed by inspectors.

This is a typical example of a fine emblem, combining good design, excellent materials, and a high degree of art and craftsmanship in production.

It is almost always the case, though unsuspected by the general public, that the material to which a finish is applied has a definite influence upon the perfection and durability of that finish. For example, products that are nickel or chromium plated stand up better if the base metal is non-rusting, as is copper and brass. To take another example, look at vitreous-enameled emblems, used as trademarks, name plates, medals, lapel pins, insignia, and so on. Most of these emblems have a copper alloy as the base metal; only that, or gold or silver, can be used.

These emblems owe their beautiful and permanent colors to silicate pastes and powders, inlaid by skilled artisans, and twice fused in a furnace at a temperature of about 1500° F. This temperature sets high standards for the underlying metal which must not warp, nor "bubble up" into the enamel. Thus visible beauty for which so much creative skill is required, depends in part on the invisible metal underneath. Revere, which takes great pains to maintain the strict standards of its alloys, is proud to meet the high requirements of American Emblem and other companies in this field . . . Perhaps Revere can help you by supplying exactly what you require to protect the finish and durability of your product.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, New York

• • •

Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.

Sales Offices in Principal Cities, Distributors Everywhere.

Measuring Machine Takes External, Internal Measurements

This measuring machine for external and internal measurements is adaptable for use as a master check and for determining accurate dimensions on pin gages, standard bars and end measuring rods. Measurements are obtained between hardened steel anvils, and flat jaws may be substituted for round plugs. Precision steel scale is graduated in inches and in millimeters. The machine comes in two sizes, No. 1 with a measuring range of 80 in., and No. 2 with a range of 120 in. Vernier is the easy-reading Chesterman type, 2.450 in. long. Machine is 8x10½ in. x 8 ft. long.

George Scherr Co., 200 Lafayette St., New York 12, N. Y.

Rotary Pipe, Tube Cutoff Wheels For All Makes of Machines

Rotary pipe and tube cutoff wheels are available for all makes of cutoff machines. Disks in 7-in. dia, 3/16 in. and ⅛ in. thick are carried in stock. They can be furnished with 1 7/16-, 1½- and 1¾-in. bore. Special-size wheels can be made to specifications.

Continental Machine Co., 1960 Maud Ave., Chicago 14, Ill.

Axle End Marker Is Cast From Aluminum Alloy

This axle end marker is cast from aluminum alloy for stamping end faces of railroad-car axles, forged wheel blocks and other large rounds. Part of the Luminum-Line, marker is furnished with any combination of characters and sizes. Holder can be adjusted to center on different size diameters, and a rounded rib design around holes protects them from off-angle blows.

M. E. Cunningham Co., 95 East Carson St., Pittsburgh, Pa.

Nylon Anode Bags Cover Metal Anode in Electroplating Solutions

Nylon anode bags cover nickel, copper, silver, zinc and other metal anodes used in electroplating solutions. Bags are made of sturdy nylon of 66x48-in. weave and are claimed to be over 50% stronger than comparable cotton bags. Tests have indicated that strength of bags is maintained in both acid and alkaline solutions at temperatures to 150 F, for long periods of time. Bags are ordinarily supplied 4 in. longer than length of anode to allow accumulation of sludge.

Enthone, Inc., 442 Elm St., Department AM, New Haven, Conn.

Improved Rossaul Copper-Brite Lowers Drag-Out by 50%

Improved Copper-Brite, a non-toxic, non-fuming bright dip for brass, bronze, copper, beryllium copper, phosphor bronze and nickel silver, is said to lower drag-out by 50%. Copper-Brite absorbs oxides and fire scale leaving metals in a bright passivated state, resistant to future oxidation. It will not discolor silver solder and is packaged in 1-gal. bottles, 5-gal. demijohns and 13-gal. carboys.

Rossaul Co., 170 Fifth Ave., New York 10, N. Y.

Chrome Lock Gasketing Material Impregnated with Zinc Chromate

This zinc-chromate impregnated gasketing material is called Chrome Lock. It provides exclusion or retention of air, water, dust and bulk conveyed materials. It is available in tapes, sheets or stampings. Chrome Lock is said to prevent corrosion and electrolysis between dissimilar metals and is resistant to flame and oxidation.

Products Research Co., 5426 San Fernando, Glendale, Calif.

Tap Holder for Close-Center Multiple Tapping Offered by Burg

This tap holder for close-center, multiple-tapping operations is called the Tool-Flex, and will tap up to 10-24 in steel at ⅞ in. center to center. Neoprene mounting compensates for both parallel and angular misalignment and prevents broken taps, bell-mouthed and torn threads. Tap holder features short overhang, shanks to specifications, self-centering, oil resistant neoprene mounting, and is made of high-grade steel, heat treated and ground.

Burg Tool Mfg. Co., 5028 W. Jefferson Blvd., Los Angeles 15, Calif., Dept. C-4.

Adapter for Taper-Lock Bushings For Straight Bores in Hubs

An adapter for taper-lock bushings is used where it is more convenient to use a straight bore in the hub than to drill and taper bore hubs to accommodate bushings. Adapters consist of a taper bored sleeve which fits into the straight bore of the hub. Bushing slips inside of adapter which is tapped to receive the bushing screws. In tightening, adapter is expanded against hub bore and contracts the bushing upon the shaft.

Dodge Mfg. Corp., Mishawaka, Ind.

High-Pressure Reducing Valve For Pressures to 6000 psi

This improved high-pressure reducing valve handles working pressures to 6000 psi. Listed as Type E, it is recommended for reducing the pressure of water, oil, and compressed air—in a single stage to 250 psi or to within 20% of the initial pressure. For lower reduced pressures reduction should be made in two stages: the first through this Type E and the second through a valve for handling working pressures to 300 psi. Valve body is forged steel; internal metal parts, hard chromium-plated stainless. Plastic-cup piston washers suit high-pressure service.

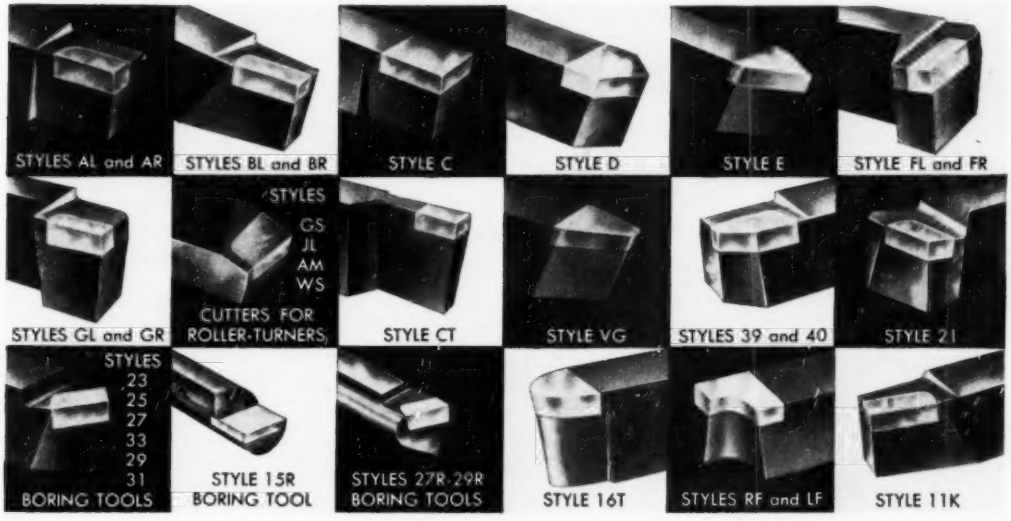
Atlas Valve Co., 282 South St., Newark 2, N. J.

REMOTE CONTROL unit for use with Westinghouse 65 line of ac welders permits operator to change current setting and adjust arc without walking back to machine. Operator presses either "raise" or "lower" pushbutton on portable station and a small motor moves core making necessary adjustment. Remote control is installed by connection on primary terminals of the welding transformer.— *Westinghouse Co., Pittsburgh, Pa.*

Now—

4 Tools for the Price of 3

25% Discount Now Applies to All Standard KENNAMETAL Brazed Tools



These tools are fabricated complete in our own plant. The tip on every one is Kennametal—made by exclusively-used processes we developed to assure that it will have consistent soundness, uniform hardness, unusually high strength. It is accurately seated on the shank, properly brazed, and ground to a smooth, true cutting edge.

Now, at less initial expenditure you are able to realize the outstanding productivity and over-all cost saving for which Kennametal tools are noted. Performance Reports, issued regularly, demonstrate the effectiveness of Kennametal tooling on a wide variety of jobs. Upon request your name will be put on our mailing list if you are not now receiving these Reports.

It will pay you to secure a copy of our new Catalog and study it thoroughly. From the extensive listing of Kennametal brazed tools you can select the style, size, and grade that will meet your specific machining requirements with outstanding results. You now get even greater value than ever before—four tools for the former price of three.

KENNAMETAL *Inc.* Latrobe, Pa.

MANUFACTURERS OF SUPERIOR CEMENTED CARBIDES AND CUTTING TOOLS THAT INCREASE PRODUCTIVITY

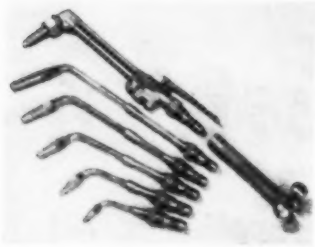
KENNAMETAL *Cost-Saving Production Methods Give You Superior Carbide Tools at Less Cost*

Improved types of milling machines expedite forming and recessing of shanks

High frequency induction equipment facilitates consistently good brazing

Automatic diamond wheel grinding speeds up uniform finishing of tools

Inspection of every tool insures sound tip, proper braze, true edge



Oxyacetylene Welding Torches For Light, Medium, Heavy Duty

A line of oxyacetylene welding torches and cutting assemblies are made in three sizes. The Lifelong series for light-, medium- and heavy-duty welding features, welding torch bodies and cutting assemblies guaranteed for the life against normal wear and tear; the Midline series for light and medium welding in garages, body shops, and manufacturing plants, and the Airline series for light metal welding and cutting of all types.

All three series of torches incorporate the Flo-Trol feature which prevents conditions leading to premixing of gases and backfire. Flo-Trol is a combination of sealing elements, cooperating with a series of gas-directing channels and a spring-loaded diaphragm valve. It permits tips to be changed in a matter of seconds, and seated in the torch body with fingertip pressure on the tip nuts. Welding tips or cutting assembly may be swiveled in any position, even with the flame lighted.

Smith Welding Equipment Corp., Minneapolis 14, Minn.

Insulating Material Covers Head Of Shortstub Electrode Holders

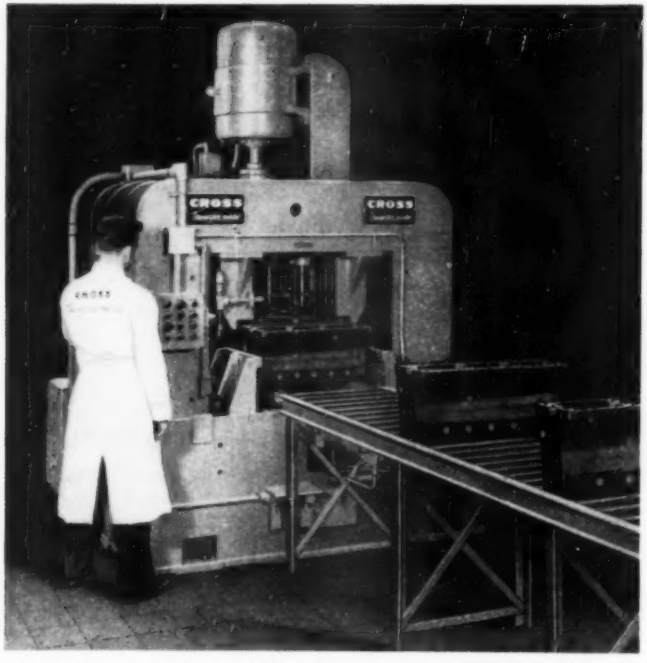
Lifeguard insulation material covers the electrode gripping head of the Bernard Shortstub electrode holders. Holders permit deposit of total fluxed lengths of electrodes. Insulation material withstands direct heat of the arc when the last inch of the electrode is being deposited. It has high resistance to impact and will not chip or crack.

Bernard Welding Equipment Co., 741 E. 71st St., Chicago 19, Ill.

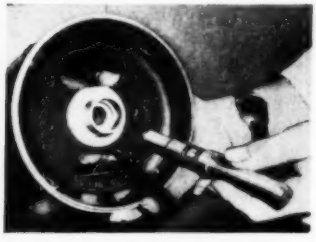
Plastic-Foam Insulating Material Expands 100 Times when Baked

This plastic foam expands to 100 times its original volume when baked. The insulating material is lighter than some gases and weighs from 10 to 20 times less than meringue on a pie. It is resistant to fire, moisture, fungus growth, and insects. Foam is made from a synthetic phenolic resin, is reddish brown in color and has a sponge-like appearance.

Westinghouse Electric Corp., Pittsburgh 30, Pa.



MULTIPLE-SPINDLE TAPPING MACHINE taps the pan rail and ends of 130 cylinder blocks per hr at 100% efficiency. Four stations are provided. First and fourth are for loading and unloading. Second and third are for tapping 30 holes in the pan rail, 14 holes in the front face, and six holes in the rear face *Cross Co., Detroit 7, Mich.*



Xactemp Thermocouple Indicator For General, Non-Critical Use

This Xactemp thermocouple indicator is for general non-critical use, and is known as the Model XA-100. It is calibrated for either Iron-Constantan or Chromel-Alumel thermocouples. A choice of several scale ranges is available.

Claud S. Gordon Co., 3000 S. Walace St., Chicago 16, Ill.

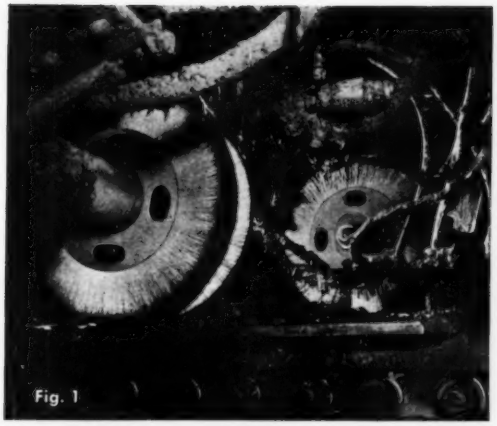


Fig. 1

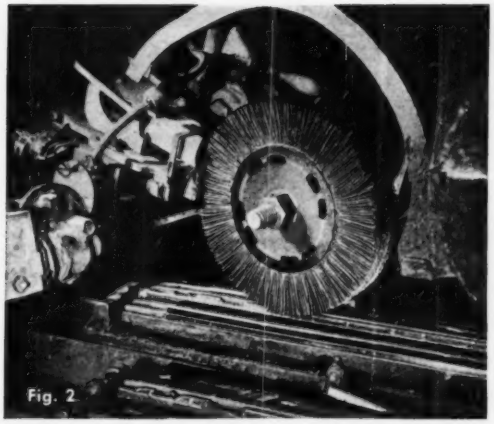
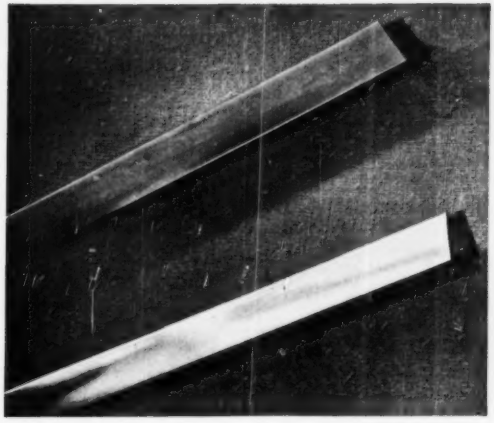


Fig. 2

HERE'S HOW TO CUT COSTS AND GET A BETTER FINISH ON STAINLESS STEEL



NEW OSBORN BUFFBRUSHES* PRODUCE HIGH LUSTRE FINISH ON STAINLESS STEEL PARTS AT FAR LOWER UNIT COST...

TWO types of Osborn Power Driven Brushes remove forming marks and produce the satin-smooth, high lustre finish found on the stainless steel window divider bars used to glamorize motor cars. Here's how it's done.

Divider bar is placed in a holder and moves on a continuous chain through the polishing line. Bar is first brushed by Osborn Monarch® Tampico Power Brushes (Fig. 1), with a spray type abrasive compound, preparing the surface for final color buffing.

Osborn's new power driven Buffbrushes (Fig. 2) and a bar compound complete the polishing operation. Approximately 6500 stainless steel window divider bars are finished by this method per day.

Time and money-saving ideas such as this are the stock-in-trade of Osborn sales engineers. This premium service costs you nothing—*can* save you hundreds, yes, *thousands* of dollars. For complete information, write—

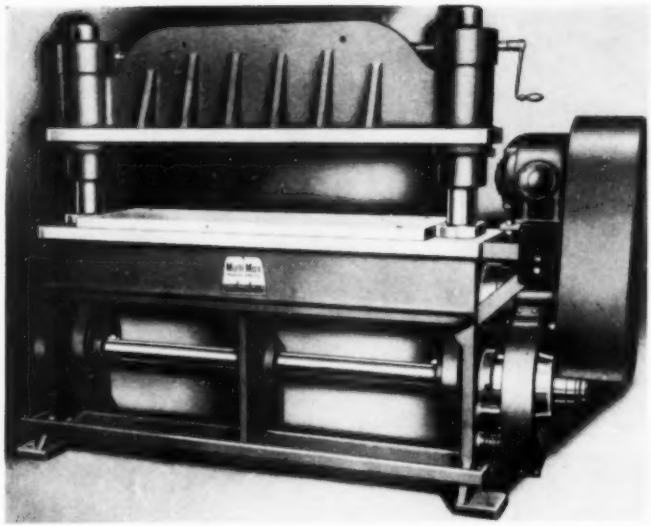
THE OSBORN MANUFACTURING COMPANY

Dept. 162, 5401 Hamilton Avenue *Cleveland 14, Ohio*

*Trade Mark

Osborn Brushes

WORLD'S LARGEST MANUFACTURER OF BRUSHES FOR INDUSTRY • POWER DRIVEN BRUSHES • PAINT BRUSHES • MAINTENANCE BRUSHES

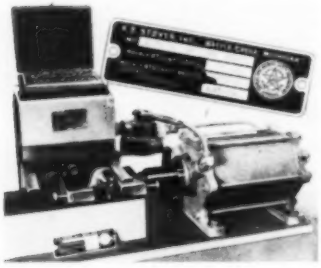


Diamond Multi-Max Punch Press Has a 30-Ton Capacity

This Diamond Multi-Max Punch Press (Model 3048) has a 30-ton capacity and a bed size (working area) of 15x$1\frac{1}{2}$x49$1\frac{1}{2}$ in. Of all-steel-weld construction, it weighs about 4150 lb and is 22 in. from front to back and 91 in. wide. Over-all height is 64 in. Machine's bull gear and pinion gear are of herringbone design. The four-point engagement clutch is a sliding clutch dog (square clutch key). A 3-hp, 1800-rpm motor is recommended to provide power for the punch press.

Mainshaft diameter is 3 in.; bolster plate, $1\frac{3}{8}$ in. thick, is 16x48 in. Hole opening in bed is 7x44$\frac{1}{2}$ in. Ram size (work area) is 10x48$\frac{1}{2}$ in. Standard stroke is 2 in. with 4 in. maximum stroke to order.

Diamond Machine Tool Co., Los Angeles, Calif.



Nameplate Marking Machine for Frequent Changes in Type, Size

This Matthews 222 nameplate marking machine marks nameplates where there are frequent changes in character alignment and nameplate size. Machine is a bench-style pneumatic type. A type box is located in front of operator. Hand or foot control valve is actuated by the air cylinder, and moves the pressure roll under the type, forcing characters into the blank nameplate panel. The second plate is marked on return stroke of cylinder.

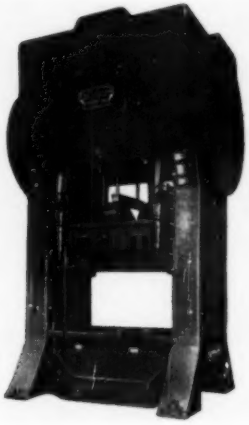
The standard Model 222 will mark a maximum size nameplate $5\frac{1}{2}$ in. left to right by 4 in. top to bottom, when marking area is located in the center of the plate. Maximum marking area is 3 in., left to right, by $2\frac{3}{4}$ in., top to bottom. One air cylinder with a 5-in. stroke is used. Three standard sizes of type, 1/16 in. 3/32 in., and $\frac{1}{8}$ in. are available from stock.

Jas. H. Matthews & Co., 3956 Forbes St., Pittsburgh 13, Pa.

Carry-All Portable Conveyor Handles Bulk, Bags, Cartons

An all-purpose portable conveyor handles any ordinary bulk material as well as bags, boxes, crates, etc. The 14-in. conveyor can be operated horizontally or elevated. Location of takeups allows fixed loading and unloading points which facilitate the use of more than one unit as a horizontal conveyor. A height of 36 in. is maintained. Handle will turn around completely to a position parallel with conveyor when backing against a pile. Forty tons per hr can be handled, and packages to 100 lb can be handled at a speed of 10 per min.

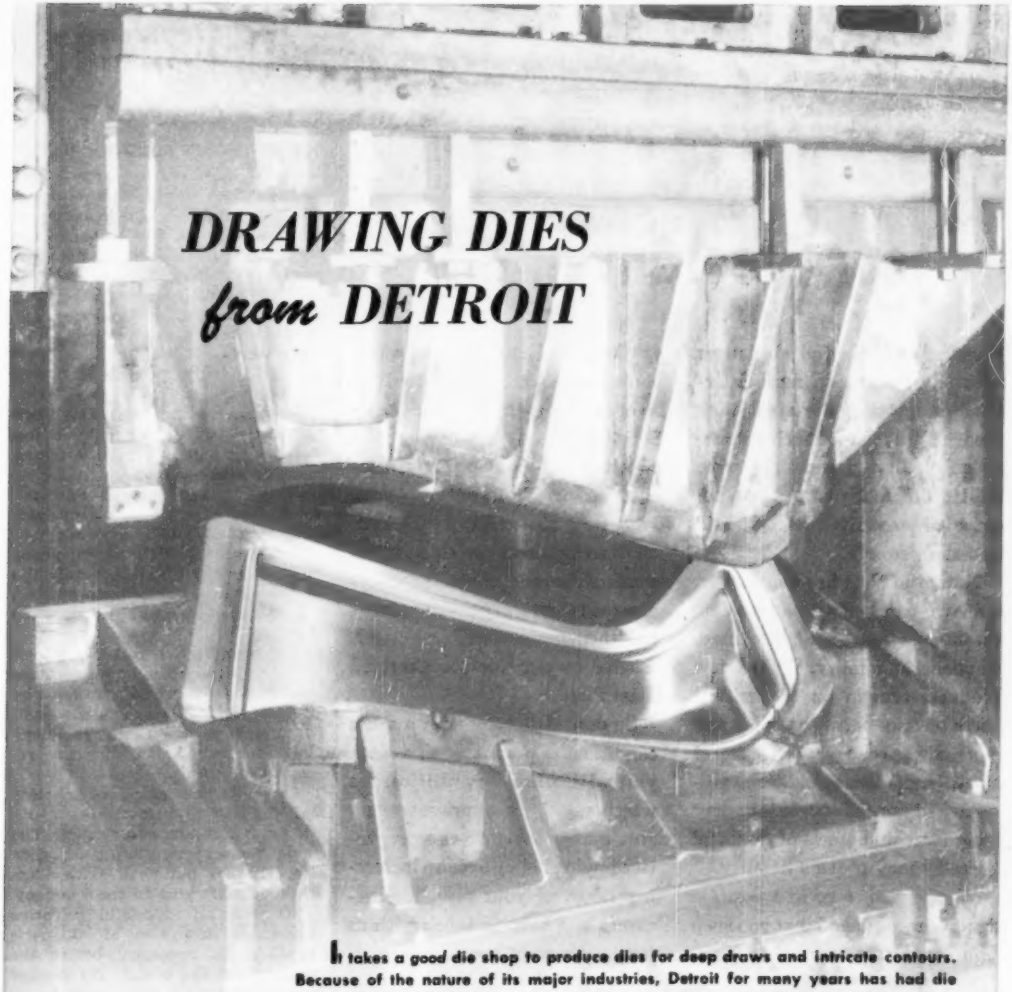
J. C. Corrigan Co., 41 Norwood St., Boston 22, Mass.



Double-Action Toggle Press Has Air-Operated Friction Clutch

This two-point double-action toggle press is double geared, with twin drive and is equipped with electrically controlled air-operated friction clutch. Press is arranged with air counterbalanced to both the inner slide and the blankholder slide, with power adjustment to the inner slide by means of an individual motor. The four corners of the blankholder slide can be adjusted manually. An extremely long dwell of the blankholder (fully 140°.) enables dwell to move back with respect to slide motion. Blankholder drops approximately 1 in. when inner slide is at top center, providing more clearance between face of slides and dies for removal of stock. Press which operates at 8 strokes per min. has a capacity of 200 tons for the inner slide and 120 tons for the blankholder slide and is equipped with a 35-ton pneumatic cushion at 100 lb air pressure, 10-in. travel, and the inner slide is provided with 23-in. stroke, and 5-in. adjustment. Bed area is 45x72 in.

The Cleveland Punch and Shear Works Co., Cleveland 14, Ohio



DRAWING DIES from DETROIT

It takes a *good* die shop to produce dies for deep draws and intricate contours. Because of the nature of its major industries, Detroit for many years has had die shops highly skilled in building drawing dies . . . and Allied's Richard Brothers Division has always ranked as one of the best of these.

Richard Brothers' abilities go much further than the actual building of dies. Here are men who, from long experience, know what can be done in the drawing of sheet metal. They can and do offer solutions to die design problems that show an end-result in clean, accurate stampings produced with a minimum of scrap. These are abilities that are most quickly recognized in drawing die work, yet are applied equally to the production of sheet metal dies of *every* type—from the largest to the smallest.

PRECISION · EXPERIENCE · ALLIED CORPORATION PRODUCTS · DEPENDABILITY

ALLIED PRODUCTS CORPORATION
Richard Brothers Division
DEPARTMENT 47
4612 LAWTON AVENUE • DETROIT 8, MICHIGAN

HARDENED AND PRECISION GROUND PARTS • STANDARD CAP SCREWS • SPECIAL COLD FORGED PARTS
SHEET METAL DIES FROM THE LARGEST TO THE SMALLEST • JIGS • FIXTURES • STEAM-HEATED PLASTIC
MOLDS • SPECIAL PRODUCTION TOOLS • R-B INTERCHANGEABLE PUNCHES AND DIES • DIE MAKERS' SUPPLIES

How to streamline Your Steel Inventory

During the past period, steel users naturally have been most interested in getting the steel they needed without too much emphasis on quality. Inventories were built up as much as possible because of excessive demand and uncertain supply.

Now, the time has come when industry can begin to streamline inventories and can place more emphasis on quality. While a few products remain on the critical list, a balance between supply and demand has been reached for most steels. Under these conditions, yesterday's "normal" inventory may loom large and steels of doubtful ancestry may prove a liability.

We are glad to be in a position again to recommend that you keep your inventory at a practical working level and use our warehouse stocks as your inventory reserve. The many Ryerson Steel-Service Plants throughout the country are particularly well equipped to help you keep your inventory streamlined. Carbon, alloy and stainless steels in thousands of analyses, shapes and sizes are ready for quick shipment—and their uniform high quality is assured by our Ryerson Certified Steel Plan.

So don't let changes in market conditions or product design catch you with high inventories. As warehouse stocks improve we suggest that you extend a conservative buying policy over an increasing range of your steel requirements and keep in touch with us for your current needs.

PRINCIPAL PRODUCTS

BARS—carbon & alloy, hot rolled & cold finished
SHAFTING—cold finished, ground & polished, etc.
STRUCTURALS—channels, angles, beams, etc.
PLATES—sheared & U. M., Inland 4-Way Floor Plate
SHEETS—hot & cold rolled, many types & coatings
TUBING—seamless & welded, mechanical & boiler tubes
STAINLESS—Allegheny bars, plates, sheets, etc.
REINFORCING—bars and accessories
MACHINERY & TOOLS—for metal fabrication

RYERSON STEEL

Joseph T. Ryerson & Son, Inc. Plants at: New York • Boston • Philadelphia • Detroit • Cincinnati Cleveland • Pittsburgh • Buffalo • Chicago • Milwaukee • St. Louis • Los Angeles • San Francisco

ROUND TABLE Discussion

PIECEWORK IN THE TOOLROOM?

Wage-incentive systems are practical and it makes little difference where they are applied. The manner of application is the key to the whole story. Toolroom wage-incentive plans are not too numerous because of the difficulty in establishing proper rates of work. Piecework as piecework is not efficient in or on any job. It leads to discontent and a slap-happy product. Properly set up wage incentive plans, with the proper checkmates, means more take-home pay to the operator and more pieces per hour of machine time for the company.

A toolroom plan requires much more than any production rate-setting plan. It must blend together all of the ideas of the recent years. It is necessary to use not only the stopwatch for establishment of overall time elements, but also standard data.

The engineer who sets up a toolroom on standard must know wage incentives from A to Z. He must be able to judge and weigh all conditions such as the necessary allowances for calculations that are required for that job.

Once the standard data is established for that toolroom the application is not too complicated. The men get an opportunity to earn more if they put forth extra effort without extra cost to the company.

As with all successful incentive plans, an inspection of all parts produced is necessary before the payment of the bonus. No worker can slight his job and expect to get compensation for work partially done.

As Al says, many short cuts are found as one progresses and a worker has the right to earn more if his short cuts produce the same quality product as that of his fellow-worker.

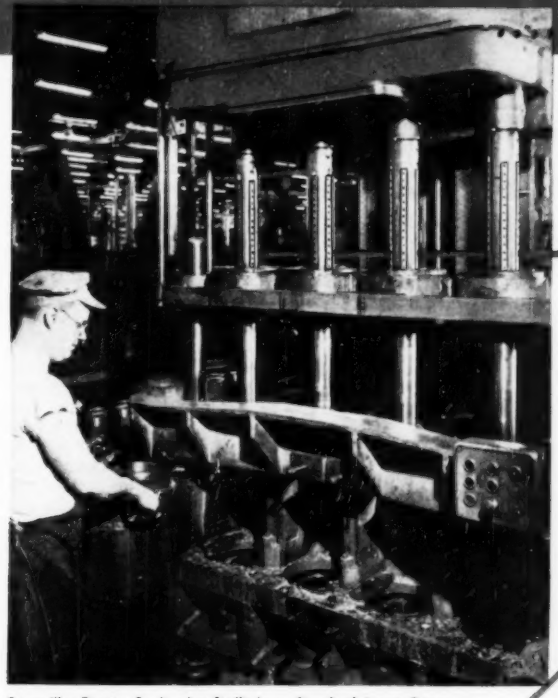
Don't try a toolroom wage-incentive program unless you are willing to spend a better part of a year establishing standard data on the shop. It isn't simple and without a proper background to establish rates, it is a sure failure. It can be done and it is successful so long as all the rules are followed. It is like everything else that amounts to anything—it is work. There is never "something for nothing."

Charles D. Townsend
Centralia, Mo.

REDUCE WEAR

. . . on BARS and BUSHINGS

. . . like "Caterpillar" does



Caterpillar Tractor Co. is using Scully-Jones Standard Ampco Bronze Wear Strips as shown here, to reduce upkeep cost on bars and bushings used in boring lines, and to maintain full production.

with

S-J SCULLY-JONES

STANDARD AMPCO BRONZE WEAR STRIPS

- *Reduce Seizing and Galling*
- *Save Wear on Bars and Bushings*
- *Maintain Continuous, Accurate Cutting Operations*
- *Cut Down-time, Maintenance and Replacement Costs*

Top and bottom view of *Scully-Jones Standard Ampco Bronze Wear Strips.*

Use these wear strips on your boring bars and driving tools, wherever friction, galling or wear are serious factors. They are easy to attach, adjust or replace.

S-J Standard, 6-Hole Type, Ampco Bronze Wear Strips are furnished in 5 sizes that meet all requirements. Available for Immediate Delivery from stock.

Scully-Jones AND COMPANY

1902 S. ROCKWELL ST., CHICAGO 8, ILLINOIS

SEND FOR New Descriptive BULLETIN Containing Prices and Specifications

R3962

YOU GET LOW COST, FAST, ACCURATE PRODUCTION WITH OUR STANDARD AND SPECIAL TOOLS

With Two DI-ACRO BENDERS

A difficult production problem of forming two bends in a long length of tubing was solved by "teaming up" two DI-ACRO Benders as illustrated. This dual-forming arrangement saved installation of special machinery. Two accurately formed bends are obtained in one operation—without distortion of the tube and at a cost competitive to power operated equipment. More than 300 pieces are completed per hour—600 individual bends.

DI-ACRO is pronounced "DIE-ACK-RO"

"DIE-LESS DUPLICATING" Often Does it Quicker WITHOUT DIES

This is but one example of how DI-ACRO precision machines—Benders, Brakes, Shears, Notchers, Rod Parters, Punches — can accurately and economically duplicate a great variety of parts, pieces and shapes, without die expense.

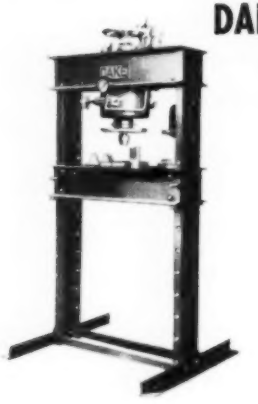
Write for Catalog—"Die-Less Duplicating"

DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING

O'NEIL-IRWIN MFG. CO.

311 EIGHTH AVENUE, LAKE CITY, MINNESOTA

DAKE AIR HYDRAULIC PRESSES



Speed Production
Lower Costs

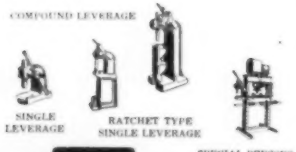
The 50PB Air Hydraulic Press illustrated is a 50-ton capacity press of compact design with all operating controls within easy reach of operator. This accelerates the work and banishes operator fatigue. A speedy press to lower costs on assembly and disassembly; broaching, trimming, straightening, and bending; blanking, drawing, and forming; riveting and many other jobs in machine shop or on assembly lines.

The 50PB is one of several in this class ranging from 25-tons capacity to 125 tons.

No hand pumping . . . finger-tip control.

Pressure Gauge . . . at eye level.

Release Valve . . . returns ram to starting position.



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THE LOST THOUSANDTH

It is a disgusting thing to a good man to get caught on this old mistake of being a thousandth of an inch small on a job. It has happened to many of us, especially in shops where the equipment was none too good in the former days. I think the circumstances and man should be the guide. Generally the occasional slip is allowed but if it happens too often, look it square in the face and find out if it's the machine or the man.

In this case it is 0.001, but I have seen such as 0.010 and 0.025 thousandths happen by misreading the micrometer. In the latter instance it was an entire revolution of the micrometer barrel. The mike had been lapped and adjusted so the barrel overlapped the spindle mark. Fifty-two pieces, 4 days' work, was involved. This man was not dismissed over it.

I was given his mike for inspection. I placed it in a tool lathe collet and filed the barrel back enough to expose the mark. I believe this man was sick from shock and the firm sympathized with him. We used the material by changing dimensions as the job permitted.

A man who doesn't use a certain machine very often is liable to get into trouble of this nature if the machine has bugs in it from wear. This is where the man who is allowed to specialize and handle special particular work comes in handy and relieves you of that worry to a large extent.

Henry Rasmussen
Niagara Falls, N. Y.

•

Ed should have gone to bat for Smithers instead of allowing him to resign, especially when it could not be proved he was the one at fault for the incorrect measurement. The company not only lost a good worker, but the respect his co-workers who would naturally feel an injustice had been done. They would have reason to feel Ed could not be trusted to back his men in any future decision, thus having a marked effect on team work and shop morale.

The chief draftsman should frankly acknowldege he was in error in permitting a tracing to be used in the shop, even though it was a rush job. Surely extra safeguards should have been taken in a case like this to eliminate the possibility of an error—a good illustration of how haste makes waste.

A number of years ago a similar unpleasant situation developed in our plant. A rush order for a number of

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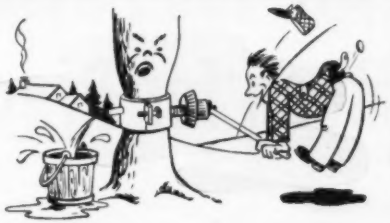

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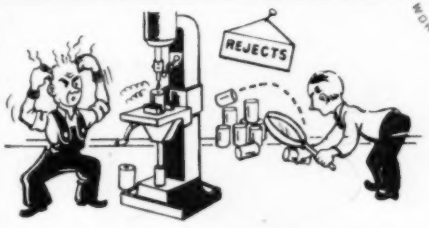

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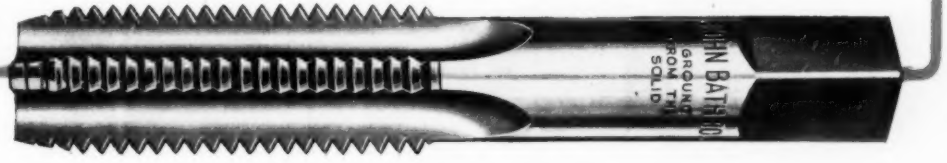

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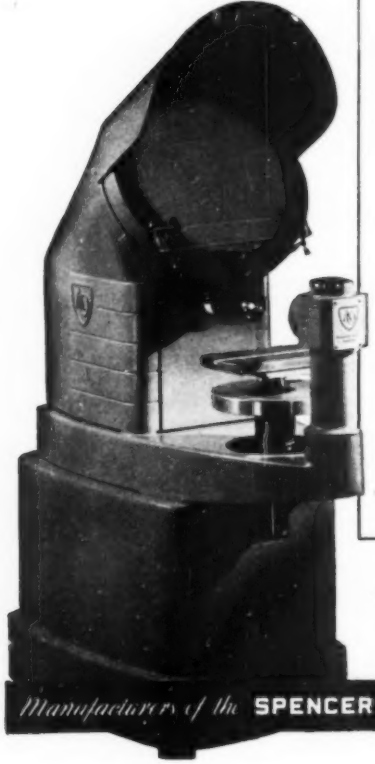

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metal patterns was received from the head office in a distant city. An expert patternmaker was assigned to the job and the work completed within the time limit set. Inspectors approved the work and the patterns shipped. Then the explosion! These patterns were for exacting experimental work and its was discovered the metal from which the patterns were made varied slightly from the original metal specified. Somewhere along the line a slight error had been made in copying the metal symbols—a $400 error.

The patternmaker, like Smithers or any other self-respecting honest workman, resigned when the higher-ups tried to place the blame on his shoulders.

This incident had a marked effect on the morale of departments not directly involved in the dispute. Passing the buck certainly paid poor dividends.

A. Tomlinson
Philadalphia, Pa.

•

From half a lifetime of experience as a mechanical draftsman and mechanical engineer, the case of "The Lost Thousandth" strikes a very responsive chord. There is only one answer to the problem of eliminating an occurrence of this nature—establishment and scrupulous maintenance of an approved system of issuing prints to the shop from the drawing room.

If the routine of issuing prints only to the shop would have been followed by the design department, there would have been no necessity to issue a rush original pencil drawing on paper, even shellac-covered for protection. In these days of efficient blueprinting practice and procedure, the quick and clear print is available in a minimum of printing time. The fault in this case stems primarily from the drafting room's issuance of an original plan. If normal procedure had been followed, the pencil tracing would have been retained in the files of the drafting room and a print issued to the shop under a rush priority printing order, as is done in our engineering department.

It is realized that blueprints issued to the shops become dirty, but if the general policy is followed by the drafting room in regard to making dimensions large and legible, avoidance of mistakes in reading a print will be reduced to a minimum. In any event, where there is any question of interpretation of a detail or dimension there should be no hesitancy on the part of the shop to call

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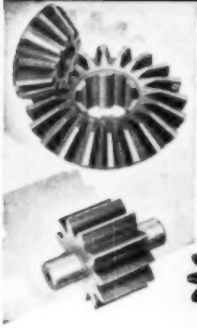

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the designer for information and clarification.

Use of the following procedure of issuing prints to the shop will be found instrumental in avoiding the problem of tampered shop drawings and the ensuing fixing of responsibility for spoiled or defective work. In the first place, under no circumstances should originals be issued. Blueprints issued to the shop of standard drawings, for use at machines, can usually be mounted for the convenience of the operator. The prints may also be coated with shellac or varnish so that they will not become soiled. Mounted drawings are usually filed in the shop, sometimes in the production office, and sometimes in the tool crib, in the latter case being issued on checks, like tools. They are recalled only when superseded or changed, but for this purpose a record must be kept in the drafting room showing where they are located.

The problem of "The Lost Thousandth," hinging on an alleged changed dimension on a shop drawing, also brings up the pertinent question of changes on drawings where the shop develops improvements that are not recorded on design plans. Changes in design are extremely important to record, as otherwise shop practice and recorded design will draw gradually apart, leaving an opening for much confusion and error, especially in the matter of repair parts, which are likely to be ordered without much thought as to their proper designation, or the aid of a sketch. Of prime importance, to avoid this, is the necessity of laying down a hard and fast rule that no changes are to be made unless authorized by the drawing room. On the other hand, too much opposition to a change for the better will have the effect of killing all tendency toward improvement suggestions, and since many of these come from the shop after the theory of the drawing is reduced to definite practice, a condition of this kind must not be allowed to occur. A definite procedure for handling changes is therefore desirable.

As far as the drafting room is concerned, changes which are slight, such as the correction of dimensions, and the like, do not require a new tracing. They are properly cared for by means of space allowed for this purpose on the tracing and a record of the drawing numbers changed, which is filed by the drawing number, giving the following information: Sheet no., item changed, date, reason, authority, executed by, and last machine built with this construc-

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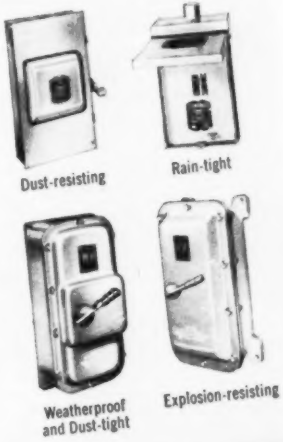

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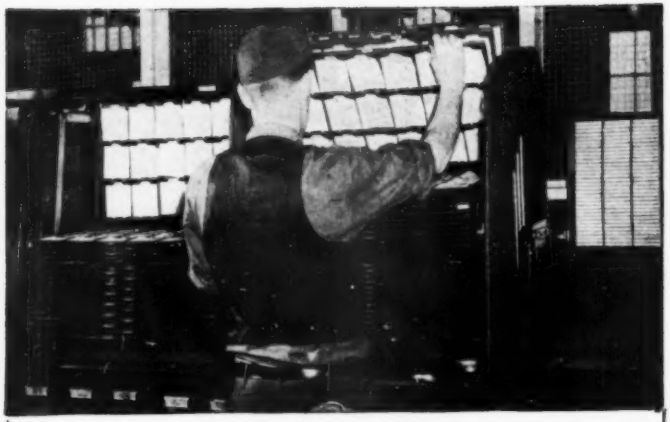

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tion. If this record is on card form, say 3 x 5-in. size, it may well serve the additional purpose of an order to make the change. Changes should be noted on the tracing in the space allowed for the purpose next to the title-space. Small changes are given key letters which locate them on the record space, as to date.

Along the same lines, another common occurrence is where a mistake on a drawing is discovered, and becomes a point of knowledge to the foreman and some mechanics, to be corrected by them when occasion requires with the next occurrence of the same work. The drawing is not corrected, but all goes well until the work is given to a new man in which case it is quite likely to be spoiled. To obviate the chance of this, definite means must be provided whereby tracings, and prints as well, are immediately changed as soon as an error is discovered. If this is not done, after a period of time the drawings and the actual work become further and further separated, and the burden of special information becomes so great that it is impossible to avoid costly errors. Also, when a new machine is completed, after the various transitory changes have been made, it is a good plan to send a draftsman down to check up his prints in detail with the construction as it stands, on the same principle that it is advisable to take a physical inventory of materials on hand periodically to correct errors in the running accounts.

In defining the degree of accuracy by placing limits and tolerances on required dimensions, the proper individuals to state what degrees of accuracy, and how much finish is required, are the chief draftsman and the designer. When a mechanic is working from an individual print, and has not seen an assembly drawing, and does not know in what connection the part he is making is used, he has no idea as to the requirements of accuracy and tolerances unless these are plainly stated on the drawing. The result is that he will generally put too much time on the piece and give it the best finish possible. This is a clear loss of money, especially in cases of parts that have no particular need for accuracy, and where the finish will not matter because they are not visible. It is therefore just as necessary and important to have this information determined by the designer and made part of the drawing, as it is to have the basic dimensions on the plan.

To avoid a recurrence of conflicts between drafting room and shop, it

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is recommended that the above suggestions be considered. However, in this specific case of "The Lost Thousandth," attempting to fix the responsibility for the mistake on draftsman or shopman is almost as futile as slamming a swinging door. However, both good men should remember that "A halo has only to fall a few inches to become a noose."

Harry Kaufman
Philadelphia, Pa.

•

In practically every general machine shop, there are rush jobs that are seldom on a blueprint. There's just a piece of plain paper showing the dimensions and instructions quite plainly when it first leaves the draftsman to the foreman.

In this case no matter what the figure or the dimensions should have been, Ed should have not only familiarized himself with them, but also in giving the sketch of the job to Smithers, should not have left him until he was sure that the man and he both agreed what the dimensions were and, in the event that such dimensions were not entirely clear, then Ed's job was to go to the draftsman to check and make sure before the job was machined. That is routine procedure and happens most any day in a general machine shop.

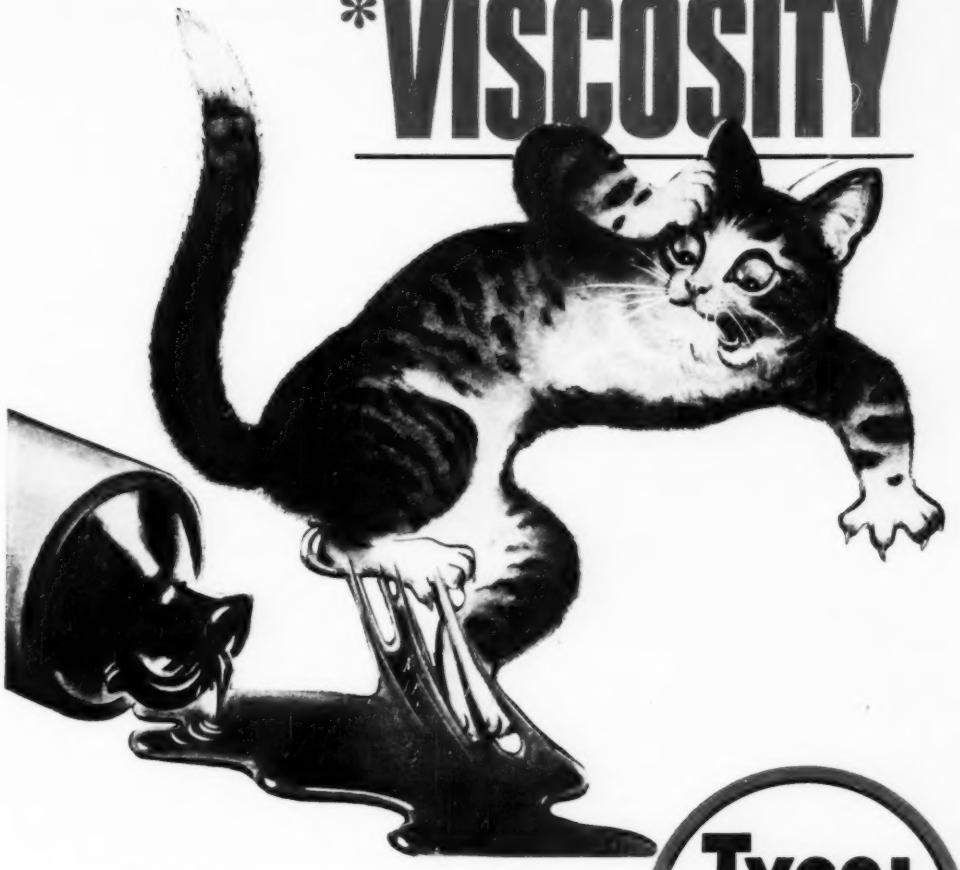
I don't believe that any blame can be attached to the draftsman here, due to the fact that even if he had made an error on the dimensions he put on the drawing, such figures were entirely clear and decipherable when the drawing first went into the shop, and it is hardly likely that any draftsman would go into the shop and change the figure without informing both Ed and Smithers.

In any case, I believe that Ed was really the culprit. He is the boss and he should have certainly checked the drawing when he gave Smithers the job, and then he would have been aware later if Smithers had erred in measurement and made the piece smaller than the required size, or if someone had changed the figure on the drawing.

When I say culprit I mean that Ed allowed himself by carelessness, in not being sure what the dimension actually was, to put himself in a position where he could not support either the draftsman or his man Smithers.

Did Smithers alter the dimensions due to the fact he erred and made the piece 0.001 in. small? Or did some mischief-maker who might have had a grudge against him change the dimensions to get him into trouble? In 50 years of shop experience I know of only one case

*VISCOSITY



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where a machinist altered a drawing to compensate for an error he had made.

In this case I am strongly inclined to give Smithers the benefit of the doubt for this reason, putting myself in his place: I believe that when I found I had made the error I would, on thinking it over, come to the conclusion that, after all, it might be possible that the piece was usable, notwithstanding it was 0.001 small of required size. And I believe probably many machinists would agree to just tell the boss and take any censure if any of the pieces were scrapped and could not be used at all. (You know, few men would alter figures on drawings, as generally they know there are duplicates in the office.) That is the reason why I don't think Smithers changed the figure.

On the other hand I think he lays himself wide open to accusation when he threatens to quit because the drawing office infers he changed the dimensions. If Smithers is a young fellow and immature I can understand him, but I believe that an older man, knowing he was guiltless, would just say, "I made the piece to the figure on the sketch," and let it go at that.

The solution is not whether Ed should back up Smithers at all. There would not have been any problem at all, if Ed himself knew what the dimensions were when the drawing first came into the shop. He failed to take sufficient interest on the job, put himself in such a position where he could not judge who was to blame.

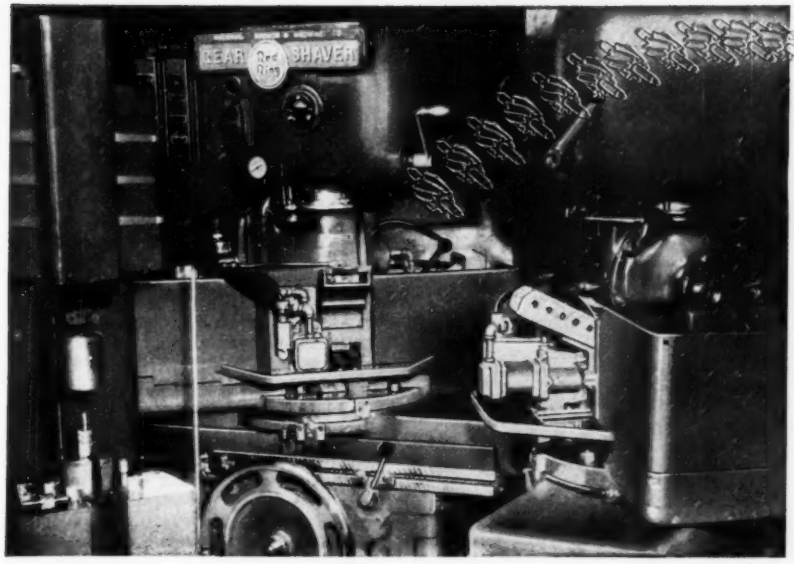
The piece was not regular production—all the more reason why Ed should have brought Smithers' attention to the actual size the finished piece was. The careful foreman would have made a duplicate of the sketch and sizes shown, in his little notebook, so that he would have proof when something goes wrong, enabling him to make a decision as to who is right.

In conclusion this case certainly proves that it is good business to have a duplicate of any instructions that go into the shop from the engineer's office.

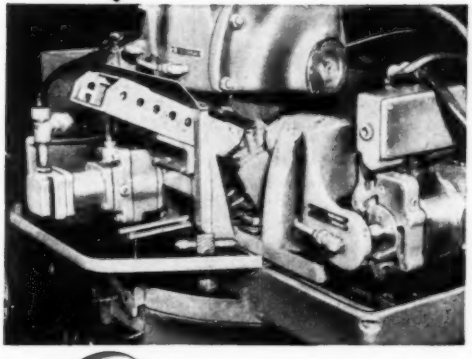
Arthur Silvester
Niantic, Conn.

•

How familiar this problem rings! It seems that engineers and the shop must always be on the point of squabbling. Yet each works for the same master. When will the engineering profession learn that there is something else besides theory? And when will they learn that just



automatic loading *Triples Production* of shaved gears



The installation of Red Ring Gear Shaving Machines equipped with automatic loaders at the Warner Gear Division of Borg-Warner Corporation has practically tripled production of twelve tooth pinions.

These pinions have a 1" face, 13.5 D.P., 20° P.A. and are DIAGONALLY shaved to the Elliptoid tooth form. Tolerance on the involute is held to .0002". An arbor is pressed into each pinion before going into the loader magazine.

The operator merely feeds the pinions into the loader magazine and removes them when ejected from the machine completely shaved. Both loading and shaving are entirely automatic while the machines run continuously.

Red Ring Universal Diagonal Machines shave gears from 1" to 12" pitch diameter by either the conventional or diagonal methods.

If you are producing precision gears in quantity, ask for descriptive literature on Red Ring Shaving Machines.

5161

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WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

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Yes, you too can have fast, automatic, low cost production from your standard hand fed drill presses and you can have it quickly, inexpensively. A Bellows "Controlled-Air-Power" Feed to feed the spindle; a Bellows Rotary Feed table, automatically synchronized to spindle movement, to feed work under the cutting tool; and you have an automatic production unit that will rival costly special machine tools in output — and at a fraction of the cost.
Bellows "Controlled-Air-Power" Devices are helping manufacturers everywhere to maintain profits despite rising material and wage costs.

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The Bellows Co.
AKRON, OHIO

because it is an engineer he can do no wrong? Surely we must stand up for our employees, but let's not get the habit of thinking we are never wrong. The boys in the shop can't live without us, but neither can we engineers live without the shop boys.

I am always a stickler to have prints go to the shop—regardless of the rush. It takes only a little less than five minutes to make a print from a tracing, so why risk all the good feelings over five minutes? The chance of having the drawing become dirty and unreadable is great if the shop does not use cellophane envelopes to keep the prints in. Even in these cases it is often necessary to remove the print to check the dimensions when the print is larger than its envelope. Chances for loss are as great as is the problem of dirt.

It never makes sense that two divisions of a company will fall out over some error of a thousandth of an inch, but they do. I have always found that to err is human and it always takes a MAN to admit his mistake. In this case, either side might be right. It seems hardly possible that a man in the shop would have changed the drawing without some good reason or directions. It was quite possible that someone else changed the drawing without either side knowing it. The engineer who thinks all his draftsmen are supermen and make no errors is riding for a great fall. My advice is "get wise, brother." The day when your men make no mistakes and you can sit back and relax will never come. Better talk with the foreman sensibly and see what can be done to salvage the lost hours which someone has caused . . . whether it be a mechanic or a draftsman. Better try to make money again instead of throwing it away in such things as arguments. It would be well for the chief engineer to take time to investigate why pencil drawings that had even been shellac-coated to save time were used instead of pencil tracing paper and prints made for the shop. It may have been the Chief Engineer's poor judgment, and I suspect it was, therefore, I'd suggest that he be man enough to face it instead of covering up by telling management his man make no mistakes. Management won't fully believe him—even though they do demand Smithers' job. He'll lose out later on. Live up to the code of the engineering profession and try to promote better relationship between your engineering department and the factory.

We have a long way to go before

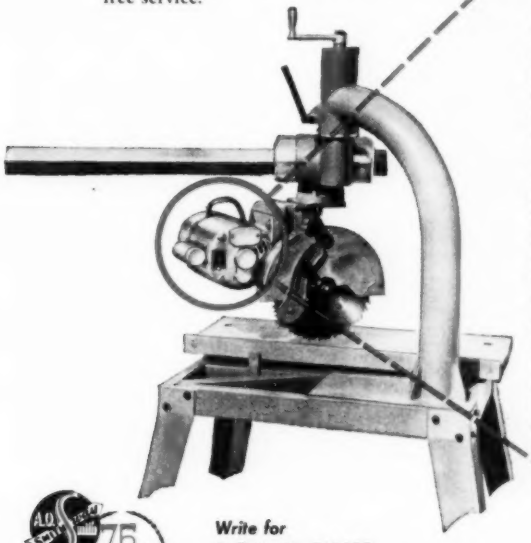
A.O. Smith Builds ELECTRIC MOTORS

for hundreds of products, including Mooradian Swing, Table, and Radial Saws

At A. O. Smith, where research itself has long been "big business," our research and engineering staff is at your disposal—to help integrate electric-motor design with your product design.

Typical of the many problems A. O. Smith has solved in engineering electric motors to specific product requirements is that of Mooradian Manufacturing Co., whose multi-purpose radial saw is pictured here.

If you are seeking improved performance in your product, or if you require special characteristics in your power component—in standard or custom-built motors—consult the A. O. Smith man. SMITHway Electric Motors are designed and built to bring to each application the maximum in compactness, safety, convenience, and trouble-free service.



MOORADIAN PORTABLE RADIAL SAW, product of Mooradian Manufacturing Co., Los Angeles 11, does the work of six machines. It has a wide range of uses, including compound miters. The operator can "gang-up" long pieces to cut multiple parts. Belt drive permits choice of many speeds not obtainable with direct-drive saws.

Says C. C. Compton, Mooradian general manager: "We especially prefer and recommend SMITHway high-speed motors because they are lighter in weight, less bulky, very powerful, and vibrationless. They deliver when the going gets tough, and make good clean cuts. They are ideal for woodworking equipment. We use them exclusively on our complete line of swing, table, and radial saws."

SMITHway ELECTRIC MOTORS for Mooradian Saws are 3450 rpm, single-phase, 115/230 v., capacitor start, ½, ¾, 1, and 1½ hp. Light, compact, with high breakdown torque, they have pre-lubricated, shielded ball bearings self-protected from sawdust and dirt. Modern SMITHway design makes them highly suitable for today's modern tool and machine designs.

ask the A. O. Smith man about electric motors for both standard and special uses

Write for Bulletin No. EM-152

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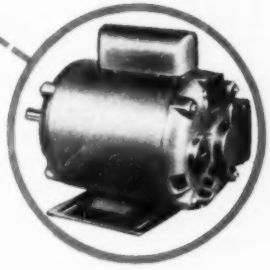
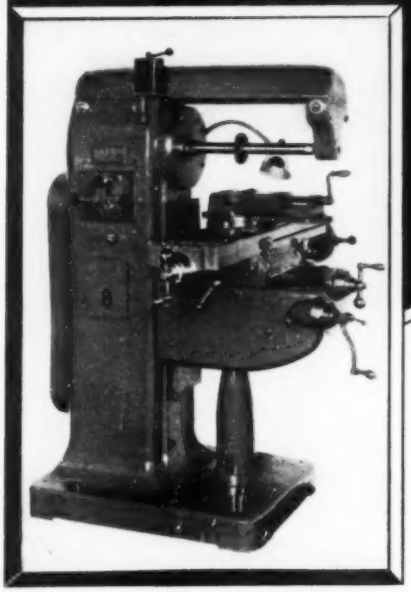
The A. O. Smith Product Service Division provides fast, low-cost electric-motor service to more than 200 authorized service stations, on a 24-hour, off-the-shelf basis. Factory Service Branches and Warehouses at Union, N. J., Chicago, Los Angeles.



Announcing the NEW MODEL 60 INDEX MILLING MACHINE



Full No. 1 Capacity and Tool Room Precision . . . now available at far less cost than comparable machines.

Note these "precision" features:

- . . . spindle heat treated and ground alloy steel.
- . . . all rapidly moving parts mounted on anti-friction bearings.
- . . . machine fully geared with alloy steel gears enclosed and running in oil.
- . . . precision ground thread lead screws.
- . . . extra capacity coolant system.

Note these 'convenience' features

- . . . conveniently located simple shift levers handle all speed changes; mechanical interlocks prevent locking of gears.
- . . . longitudinal power feed provided with positive stops either direction.

Low maintenance, too

- . . . overarm of sliding ram-type design, locking securely front and rear.
- . . . dove-tailed arbor support fitted with Oilite bronze arbor bushings and further lubricated from oil reservoir.

Also:

Manufacturers also of Model 50 and Model 40H Vertical Milling Machines.

Note these 'big capacity' features:

- . . . accommodates Type A arbor, 15", Type B 18" . . . also Type C, face mills bolted directly to spindle nose.
- . . . largest cutter accommodated 11½" diameter.
- . . . standard table working surface 32" x 9". Overall size 40" x 9". Optional table 6" longer.
- . . . longitudinal feed 26"; transverse 9"; vertical 16".
- . . . arbor supports for Types A and B available.

INDEX MACHINE CO.

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SEND TODAY for COMPLETE INFORMATION

INDEX MACHINE CO., JACKSON, MICH.

Kindly send me full information about your new Model 60 Milling Machine.

Name ..... Position .....

Company .....

Address .....

we can sell ourselves to the hourly worker and foremen. Why not embark upon this problem and help solve it? The solution lies with the engineers.

Charles D. Townsend
Centralia, Mo.

•

HARD SENSE or HARD HEAD

Again I must string along with Al in the problem. There is no one thing except a desire on our part to want to be thoughtful of the other fellow's ideas, and to so persuade him with his ideas merged into our own that we both feel we can accomplish the things we both seek.

In this case I do think Ed and Al should get Sampson's point of view and consider it along with their own angle. There is no better way I know to make a man feel important than by asking his opinion on the job to be done. Ed and Al would not be admitting the job has them licked.

Emerson once remarked: "Every man I meet is my superior in some way. In that I learn from him."

The executive or foreman who is not interested in other people's ideas has the greatest difficulties in life and provides the most injury to others. Many of our famous men have gained their fame by their ability to deal with people and make use of combined ideas. We should encourage ideas and suggestions at all times by talking them, hearing them, reading about them and by being an actual part of them. Ed and Al should trust these men as associates, have confidence in them rather than regard them as shop help.

A. E. Salmons
Philadelphia, Pa.

•

I'm wondering if Ed would ask his boss to buy a new $5,000 machine to do a certain job, when with a slight change that old timer in the corner will do the job just as fast.

If Ed thinks he is the super-brains, he had better stay out of a poker game. Lots of the boys in the war thought they knew all about poker and lost all they had except their GI shirts.

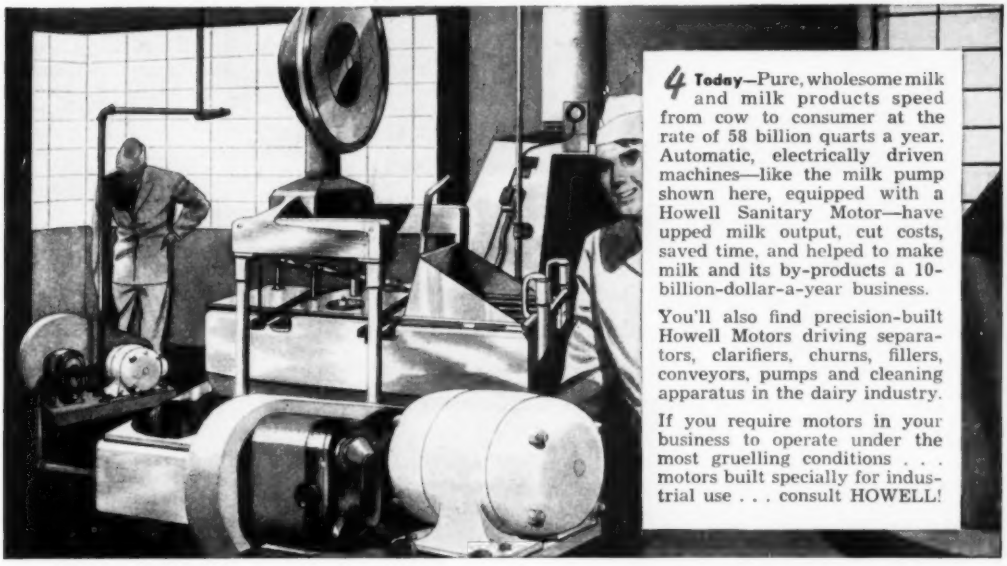
The best foremen are not always the men that know it all. They know how to use the brains of the men under them and direct their efforts. A good man will work much harder when he knows it is his brains that are going into the work and that he will get credit for his efforts. But don't forget to give him credit for what he did. If Ed should have one

1 **1770**—Improvement of livestock by selective breeding boosted milk output . . . encouraged dairy farming. City folk now began to sample this wonderful beverage. But harmful bacteria in milk caused sickness, spread disease.

2 **1864**—France's Louis Pasteur won world acclaim by discovering how to rid milk of impurities. Milk soon became an important source of food. Vitally needed was electrical horsepower to speed it from farm to consumer.

3 **1915**—The year Howell Electric Motors arrived also marked the widespread use of the automatic rotary bottle filler and capper in the dairy industry. Soon, these rugged, industrial type motors were widely sought in many industries.

MILK . . . 58 BILLION QUARTS ANNUALLY!



4 **Today**—Pure, wholesome milk and milk products speed from cow to consumer at the rate of 58 billion quarts a year. Automatic, electrically driven machines—like the milk pump shown here, equipped with a Howell Sanitary Motor—have upped milk output, cut costs, saved time, and helped to make milk and its by-products a 10-billion-dollar-a-year business.

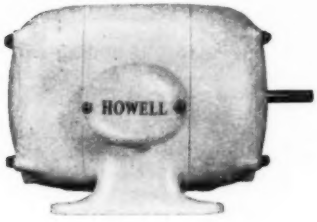
You'll also find precision-built Howell Motors driving separators, clarifiers, churns, fillers, conveyors, pumps and cleaning apparatus in the dairy industry.

If you require motors in your business to operate under the most gruelling conditions . . . motors built specially for industrial use . . . consult HOWELL!

Free enterprise encourages mass production, supplies more jobs—provides more goods for more people at less cost.

SANITARY MOTOR

For dairy and food processing industries. Complies with latest 3-A Sanitary Specifications.



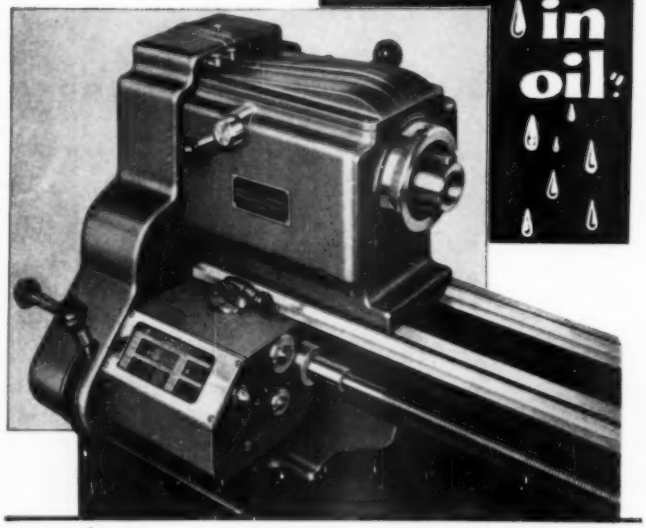
HOWELL MOTORS

HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.

Precision-built Industrial Motors Since 1915

HOWELL Red Band MOTORS

Enclosed, running in oil!



A statement that should mean much to anyone contemplating the purchase of a lathe because it will mean much after the lathe is purchased and has had years of use. Gears running in oil run smoother, last longer. These are features you may expect in higher priced lathes but no where else can you find them in the price class of the Clausing 200 Series.

The Clausing Series 200 Lathes are belt driven, back geared. 12" swing, 7-3/4" swing over saddle, 24", 36" and 48" between centers, long taper key drive spindle nose. Prices range from $560.00 up.

CLAUSING MANUFACTURING CO.

OTTUMWA, IOWA

Please send complete literature on Clausing Series 200 Lathes.

CLAUSING MANUFACTURING CO.

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Address _____

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Since 1931

of the men solve the problem and then take all the credit for it he will lose a good man or two and wake up some day to find that someone has doubled-crossed him and completely fouled up a job.

If Ed is the kind of a boss that has to do all of the thinking and will not let a man under him use his brains he is not fit to hold his job. He should be set-up man for a line of automatics. Set them up and start them and they will do as they are told. And the beauty of it is that they never talk back.

If you treat a man as an equal and give him credit for knowing something you will get results. If you treat him as a machine and his brain and experience are valueless he will get somewhere (someplace else and fast).

Chas. O. Rankin
Ontario, Calif.

•

We make a practice of calling on shopmen to solve some of our mechanical problems. One interesting case was a somewhat complicated punch and die that gave constant trouble requiring considerable expense in maintenance by a first-class diemaker. We called this man in with the object of having him built a new die. He was instructed to forget the old die and use his best judgment in developing a better one.

The result was a masterpiece of design and workmanship without prints. A few of his own sketches with dimensions were later used to make drawings for future use. This die has increased production better than 30%, with a minimum of maintenance. For this outstanding job the diemaker received a bonus of $500, tax paid.

P. J. Cassidy
Supt. of Engineering
Gillette Safety Razor Co.
Boston, Mass.

•

Ed thinks that in admitting to the men that this problem has him licked and asking for their cooperation, it is a sort of death-blow to his pride. Well, pride won't lick the job and you can't let the grass grow over it while the customer waits for it. Otherwise the result will be that Al and Ed will be looking for another job and they have to continue to eat.

Ed's attitude is just like that of the majority of old-time executives years ago. They often got stuck on problems of machinery and assembly, but they would not dream of asking the cooperation of any bright

SKF Spindle Bearing Design

The Norton Surface Grinder, equipped with a Pope precision motorized spindle, uses a typical SKF Spindle Mounting for maximum rigidity and accuracy.

SKF Double Row Cylindrical Roller Bearings assure minimum runout at the wheel.

SKF Thrust Ball Bearings virtually eliminate any "camming action". Vibration is reduced . . . smooth operation assured on these grease-lubricated bearings. Our engineers can help with SKF machine tool bearing applications. Write: SKF Industries, Inc., Philadelphia 32, Pa. 6610

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Those who use small, precision gears as component parts of their completed assemblies can profit by the convenience and economy of producing them on the Hamilton No. 1 Precision Gear Hobber.

Built to extra close tolerances, the Hamilton No. 1 is designed also for super-rigidity to provide *lasting* precision under heavy loads. Hobs spur, spiral, and bevel gears, gear sectors, splined shafts, pinions, and worm gears of fine-watch precision and on high production schedules.

Speed, feed and indexing can each be set independently of the others. This feature, plus the wide range of Hob Spindle speeds (109 to 1259 R.P.M.), provides the machine with extra versatility; cuts set-up time far below previously acknowledged minimums and permits easy adjustment of speed and feed to the requirements of material being worked or gear size being hobbed.

The ideal Gear Hobber for use in shops where set-ups are frequent or in shops where runs are long.

For full information write for our new Bulletin H 1-49.

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SUPER-SENSITIVE DRILLING MACHINES · TAPPING MACHINES · PORTELVATORS

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workman on the job. The result was progress but slow and expensive.

Well, times have changed, and also the attitude of the top executives and also the foremen. Nowadays if you have got an idea or method that in your opinion will save time, effort and money for your employer, the vast majority of them not only welcome your submitting them, but request you to send them in. They will and do pay handsomely for them if adopted.

We know we all learn from each other and Ed's problem is a typical case. I have no doubt that probably all of Ed's men have benefited greatly by their association with him and had the benefit of his long experience that has helped to make them better workmen in every way. When Ed has a problem, and he has the stupidity to not ask for the same help he is dishing out every day as a boss, because he thinks he will lose face, then he is making a serious mistake. The vast majority of machinists dearly love to be in the limelight and if Ed invites them to help solve the problems he and Al have got, and they lick it, they will be so tickled at their success they would have nothing but a feeling of exultation and pride that would offset by far any feeling that they licked a job when the boss failed.

There are no finer sportsmen than the average crowd of machinists, and when any boss is frank and invites them to help and tells them that temporarily he is licked, their loyalty, appreciation and cooperation can be guaranteed, and without anybody getting a swelled head or, on the other hand, the feeling of humiliation that Ed seems to think would result if he asked the cooperation of some of his men in solving the forming-die problem.

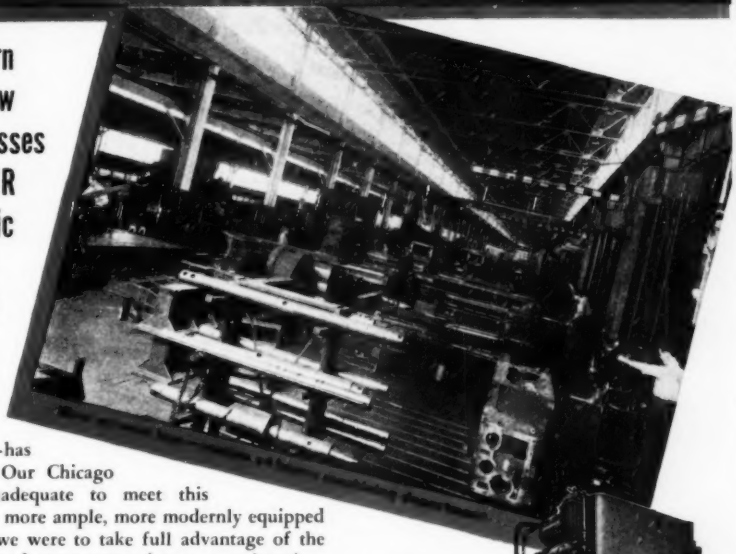
Of course, there always are a few people who gloat over anyone having trouble, and in the possible event they were called upon to help, and they did solve the difficulty, that type is likely to boast of their ability when the boss had failed. But even so, it would still be worth it. The show must go on, so stick your pride in your pocket, Ed. The problem will be licked, you will have gained further knowledge and experience, the customer gets his forming die, and there is no doubt that the time will come when the one or two fellows who are pleased to see you and Al temporarily stuck on how to proceed on this problem will be glad to seek your cooperation and help later when they have some job that puzzles them as to the next step.

Thus the correct balance automatically adjusts itself, by mutual

HERE IT IS!

ELMES' *New Home* in CINCINNATI, OHIO

In This Ultra-Modern Plant, ELMES Is Now Building LARGER Presses And An Even WIDER RANGE Of Hydraulic Press Equipment Than Ever Before!

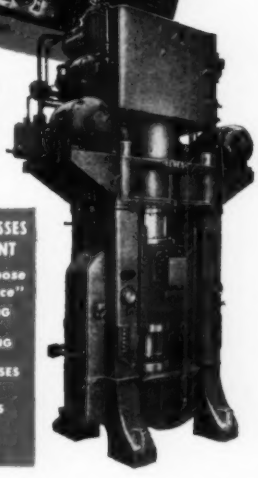


During recent years the demand for ELMES Hydraulic Equipment of all types—particularly larger type presses—has grown by leaps and bounds. Our Chicago plant proved increasingly inadequate to meet this stepped up demand. A move to more ample, more modernly equipped quarters became imperative if we were to take full advantage of the 98-year-old ELMES reputation and our opportunity to serve American industry on an ever-expanding scale.

That move is now complete. All of our facilities—engineering, manufacturing, sales and management—are now located at Cincinnati, Ohio, in the great new plant pictured here.

This plant is one of the largest and finest in the industry. Its equipment is of the very latest type, unsurpassed for precision accuracy and high productivity. This superior machinery and extensive facilities of our new plant are enabling us right now to achieve production economies even beyond our own high expectations.

Visit us in our new home! We cordially invite you to see for yourself why ELMES is now in position to produce the very finest of Hydraulic Press Equipment on a basis of *economy plus.*



4 OPERATING CYCLES, DRAWING & FORMING PRESS

HYDRAULIC PRESSES AND EQUIPMENT

"For Every Purpose . . . Every Service"

METAL-WORKING PRESSES
PLASTIC-MOLDING PRESSES
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VALVES
ACCESSORIES

ELMES ENGINEERING DIVISION of AMERICAN STEEL FOUNDRIES
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Distributors in Principal Industrial Centers. • Also Manufactured in Canada

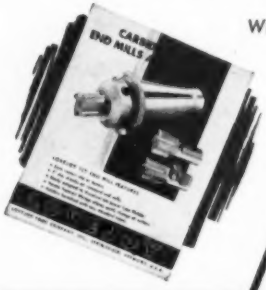
Announcing

A NEW LINE OF COST-CUTTING CARBIDE-TIPPED End Mills

Lovejoy's new end mills and holders are designed for lower cost metal removal — proved on every job where they are running. Two-flute mills are available from ½" to 1" in dia., and four-flute from ¾" to 2". All have 1" dia. shanks and are tipped for cutting cast iron or steel. Single-flute end mills are available at low cost for testing before using multi-fluted end mills on production jobs. The well-known Lovejoy positive-locking device is used to hold the end mills immovably in the holders and provides quick change of cutters. Another type of adjusting shoe may be provided for use with standard set-screw type holders.

Lovejoy end mill holders are available with Nos. 4, 5, 6 and 7 Morse Taper, Nos. 7, 8 and 9 B & S Taper, and Nos. 40 and 50 N.M.T.B. adapter.

Lovejoy engineers are at your service to recommend standard sizes or design special end mills for individual needs.



Write for new End Mill Bulletin

"TOOL BITS"

Lovejoy makes a complete line of flywheels which are a valuable addition to most end mill jobs. They increase cutting life, lengthen runs between grinds, improve finish and reduce work spoilage. Write for Lovejoy Flywheel folder or ask for free help in choosing the right type for your jobs.

Lovejoy
TOOL COMPANY, INC.
SPRINGFIELD, VERMONT

help and cooperation as and when needed. Of course, you cannot dislocate the whole gang by bringing them in on the die problem, so that Al's idea of discussing it with Sampson is excellent, as he has had some previous die experience. Others who have also had similar experience could also be called upon to cooperate, and if by the combined efforts the problem is licked, as I am certain it will be, a suitable bonus, divided according to proportion of real help from the fellows who participated, should be given to them.

It is good business for a boss really to interest himself in what the applicant for any job write down when specifying all his previous employment and any special skills he may have when he fills in an application for the job. Sooner or later some problem will come along, as in Ed's and Al's shop, that calls for a special skill and experience, and you may have the very man right under your nose and be unaware of it, unless you are familiar with the background and experience of all your employees.

Arthur Silvester
Niantic, Conn.

TO THE EDITOR

The letter from Charles Jorgensen (*A.M.*, June 2), reminds me of a similar experience.

Some two or three months ago, the personnel director of the Halliburton Oil Well Cement Company, Duncan, Okla., told me that his organization had found it necessary to employ a liaison man to work between the engineering department and the shop or fabrication department. This was done to prevent the engineers from "cooking up" some impossible piece of equipment which not only could not be fabricated in the shops, but also had no practical value to the company. The man they chose to work between the two departments was a crack machinist and a practical design man who had some engineering background.

C. E. Hoffman, Asst. Prof.,
Industrial Arts Education &
Engineering Shop
Oklahoma A & M College
Stillwater, Okla.

•

Are Young M. E.'s Theorists?

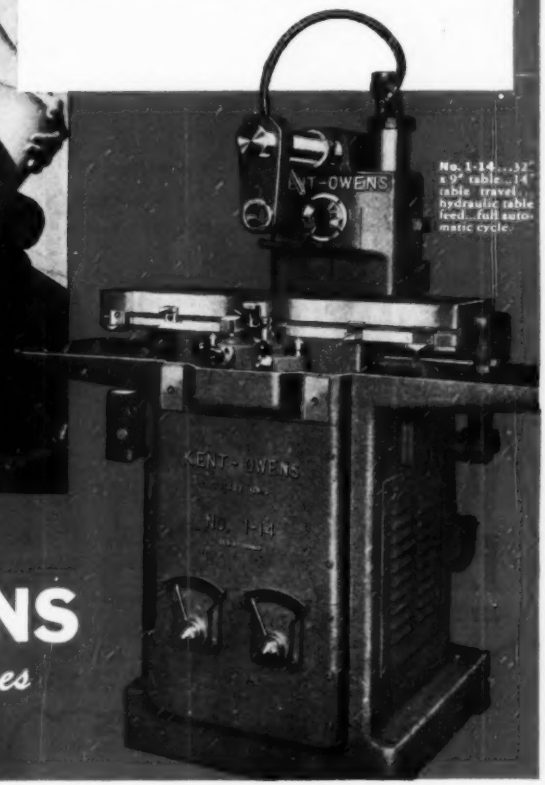
The young M. E. graduate of today *is* a theorist (see *A.M.*, April 7) because it is impossible for him to obtain practice in each field or

Breeze right through

TOUGH MILLING JOBS WITH KENT-OWENS MILLING MACHINES

Now is the time to "chart your course" to greater production and lower costs . . . with Kent-Owens Milling Machines!

Designed for *top-speed* and *accuracy* where the going is tough . . . ruggedly built . . . efficient . . . dependable. Especially, you'll like the many practical features of Kent-Owens Machines that save job-time and labor. Write for bulletins on the Kent-Owens Standard line . . . including wide range of hydraulic and hand operated machines. Also, let our engineers help you with special machine requirements. Kent-Owens Machine Co., Toledo, Ohio.



No. 1-14 . . . 32" x 9" table . . . 14" table travel . . . hydraulic table feed . . . full automatic cycle.

Call on

KENT-OWENS

for Milling Machines

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BILLETS AND FORGINGS FOR PRODUCTION, TOOL ROOM AND MAINTENANCE REQUIREMENTS.

high strength
real toughness
long wearing
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branch of engineering in four years. In fact, very few graduates get experience in every field during their entire lives. If the schools increase machine-shop time, they must sacrifice time in other courses. Many schools do not include sufficient laboratory courses in metallurgy, which is just as important as machine-shop practice.

When one considers the various subjects studied by the M. E. student, he is surprised that so much is covered in such a short time.

Upon graduation, the young M. E. thinks he is qualified to handle everything and anything in the mechanical engineering line, but it takes him a few years to learn the practical side of a specific branch. His four years of college training were spent in learning the theory of all the phases of mechanical engineering. If it was possible for him to know which branch of engineering he was going to follow, he could take specific courses in that field and drop others. His degree could specify which branch he specialized in, tool, power plant, automotive, production.

This graduate would have the advantage over the catch-all mechanical engineer because he had time to take extended courses in his specific field. The employer would also prefer the specialist because he would know how much to expect from him. The tool engineer would have more time to spend in the machine shop because he would spend little time on power-plant design. If the graduate with a B.S. in automotive engineering wished to be ranked as a mechanical engineer, he would have to get his master's degree or spend a certain number of years in practice before applying for his license.

This procedure would upset today's schedules and classifications, but it would be a step toward standardizing the title of "engineer" which is so confusing to the public. A mechanical engineer is expected to handle everything from operating a steam engine to manufacturing atomic engines. Each employer has his own interpretation of the title "mechanical engineer"; these include everything from a first-class machinist to works manager in the metalworking industry, from a stoker to the chief engineer in a power plant, and production clerk to production manager in a manufacturing plant.

The engineering field is very progressive and each year more and more must be learned about it. Tomorrow's engineering graduate will be more of a theorist than today's.

Frank J. Zarnowski
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PRACTICAL SHOP MATHEMATICS—*Vol. 2 (Advanced), 3rd Edition. By John H. Wolfe, Sc.D., formerly director of apprentice training, Ford Motor Co., and Everett R. Phelps, PhD., professor of physics, Wayne University. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., N. Y. 18, N. Y., 356 pages, 5x8 in. Price $2.60.*

The new third edition of this popular shop mathematics text is a complete revision of the previous book. New material and improved presentation make it of even greater value for teachers or for home study. The more valuable features of the earlier edition are retained, while a number of new topics are included. Of particular interest is a section on pictorial presentation of compound angles and orthographic projections, together with a series of solid geometry propositions followed by the compound angle problems in which they are used. Some of the problems are completely worked out. Tool, die, and drafting room applications are included to familiarize the student with all the types encountered in actual shop practice.

•

HOW TO KEEP INVENTION RECORDS—*By Harry Aubrey Toulmin, Jr. Published by Research Press, Inc., Dayton, Ohio. 78 pages. Price $2.50.*

Stressing the necessity of adequate patent records, this compact little book tells the reader how he can protect his patent property. Basic charts and record forms are helpful, as is the brief summary of the law. Information given is based on latest decisions made by the Supreme Court. Chapters treat protection of industrial property, monopolies granted by governments, record forms, and patent investigations.

•

MATHEMATICS FOR INDUSTRY. *By S. E. Rusinoff, Ass't Prof. of Mechanical Engineering, Illinois Institute of Technology. Published by the American Technical Society, Drexel Ave. at 58 St., Chicago 37, Ill. 519 pages, 6x8½ in. Price $5.50.*

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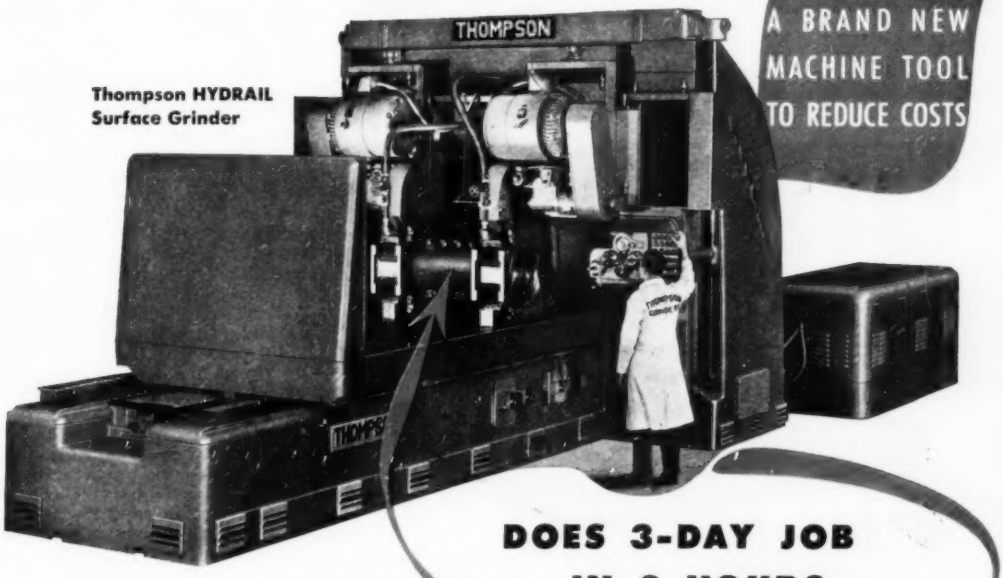

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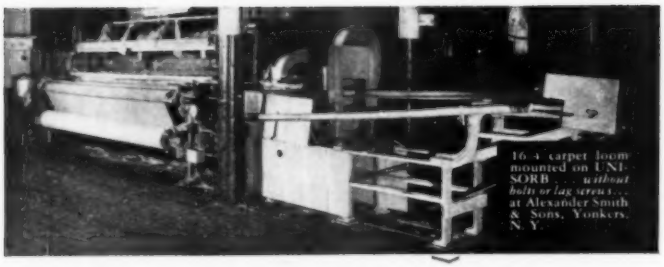

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The first seven chapters, starting with review of arithmetic, cover algebra, geometry, and trigonometry. Five additional chapters discuss screw threads, gears, logarithms, the slide rule, and practical engineering computations. A number of useful tables are included in an appendix. Intended for the shop, it will prove an excellent reference source for many engineers and executives, when they need an occasional memory refresher.

•

STRENGTH OF MATERIALS. *By Dr. Charles O. Harris, professor of engineering mechanics, University of Notre Dame. Published by the American Technical Society, Drexel Ave. at 58 St., Chicago 37, Ill. 212 pages, 8½x11 in. Price $4.90.*

Knowledge of strength of materials is desired by many people in industry other than engineers. This book was developed to meet the need of these people. Step-by-step procedure for working out each problem is a positive means of providing maximum benefit. Practical shop problems following each chapter provide a link between text and application. Most of the problems are solved without higher mathematics and most calculations are done on the slide rule. Topics of particular importance in modern industry receive special consideration.

•

REFRIGERATING PRINCIPLES & PRACTICES — *By Norman Sharpe, chairman of Refrigerating & Air Conditioning Dept., California State Polytechnic College. Published by the McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N.Y. 6½x9 in. Price $4.*

Warm weather coming! Are your principles rusty? Written to assist the student of refrigeration to couple the principles of refrigeration directly with practical application, this book deals *with* the subject rather than about it. Equally suited as a "brush-up" source for the engineer or a familiarization course for

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WITH sales of its fork-lift trucks and industrial towing tractors exceeding all expectations, and with its position of production and engineering leadership firmly rooted in rich, productive soil, Clark Equipment Company, in its 30th year as a builder of materials-handling machines, has found it desirable to establish a nation-wide organization of independent franchised dealers as exclusive distributors of the products of its Industrial Truck Division

THIS is indeed a far cry from 1939 when the entire output of the Industrial Truck Division was sold with ease by a handful of men!

TODAY'S volume is twenty times that of 1939; and the Company's stature—financial and engineering—is more than twenty times as great as in 1939. A considerable number of the '39 machines are in daily service, and many older machines are in regular operation after 20 and 25 years. The conviction is natural that 30 years hence many '49 machines will still be "on the job" alongside the new output of 1979. There will be no "orphans" bearing the name "Clark."

TO KEEP PACE with increasing demands, and to deliver the broad and competent service which Industry expects from Clark, the Company has chosen this plan of selling through independent dealers as a sound and logical evolution. Until the middle of 1948, approximately one-third of Clark's Industrial Truck Division representatives were on an independent dealer basis. It is expected that by the end of 1949 the nation-wide dealer organization will be complete.

HEADING up the dealerships or actively participating in them are key men of Clark's erstwhile factory-branch sales offices—factory-trained men, tested and proved as capable materials-handling counselors. These men share with Clark management the conviction that they can deliver, under the new plan, a broader and more valuable service to their customers and to all users of mechanized materials-handling; that they face broader, deeper vistas of opportunities which ambitious men so earnestly desire—opportunities for independence, for building greater earnings by their own efforts, for achieving prestige and leadership in their communities.

ANOTHER influence which furthered the plan is the fact that Clark management historically has been engineers and manufacturers. By decentralizing marketing activities, Clark can intensify its emphasis on development of better materials-handling machines and methods—to the end that Clark products shall achieve even higher excellence at lower cost, shall become still more valuable to industrial users and to the dealers who serve them.

THROUGH your Clark dealer, all the advantages of Clark engineering, integrated production and matchless experience are quickly available to you. He is fully qualified to make an unbiased appraisal of your materials-handling operations, and to recommend the type of machine that will serve you most efficiently at lowest cost. It's "good business" to CONSULT CLARK.

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the executive planning new equipment, treatment is very thorough. Chapter arrangement follows the solution of an average refrigeration problem. Many worthwhile construction hints and safety measures are included. Noteworthy, is the extensive discussion of refrigerants, as well as the mechanical and theoretical aspects of the subject.

Numerous diagrams, charts and tables illustrate the text. The American Standard Safety Code for Mechanical Refrigeration follows the final chapter and an eight-page subject index provides ready reference for the man in a hurry.

•

ALLOY STEELS—*By J. Winning, Dipl. R.T.C., A.I.M. Published by Emmott and Co., Ltd., 31 King St. West, Manchester, England. 72 pages, paper-bound, 5x7 in. Price 2s6d. No. 49 "Mechanical World Monograph Series."*

Metallurgy as an art is slowly giving way to the scientific developments which provide a planned-for result. This book provides a "mild" technical concept of the basic knowledge required by engineers or technicians working with alloy steels. Numerous pictures and tables illustrate the text, which covers structural, carburizing, tool, and stainless steels. The final chapter discusses some of the important factors of machinability. As a reference source, *Alloy Steels* should be helpful to the person who wants a working knowledge of the subject, in a minimum of reading time.

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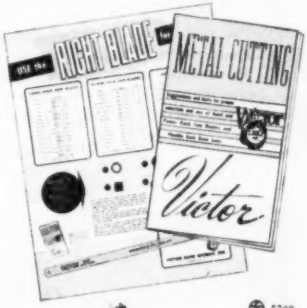

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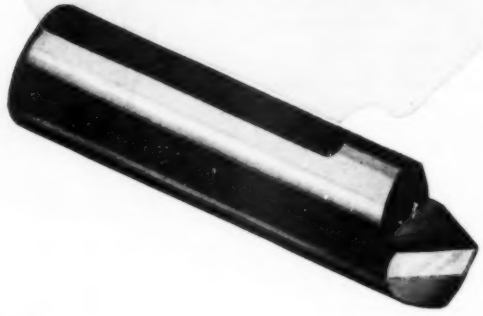
Precision

BORING MACHINES



WE'RE in business to save you money . . . by producing single point carbide boring tools exactly to your specifications at unusually attractive prices. These tools can be shaped not only for boring but for facing or chamfering as required.

We are talking price because that is the outstanding advantage offered in our highly specialized service. We are set up with production methods and equipment geared to one objective . . . high quality at low cost. No premium is charged for the shape required, and prices are based solely on the diameter of stock and its length.

The easiest way to prove the value of our service is to send us blueprints of the boring tools you require and let us make them up for you. Our catalog, available promptly on request, will give you an idea of the sizes on which our production is concentrated. *Write for your copy today.*

●

We are prepared to furnish Precision Carbide Boring Tools in a wide range of diameters and lengths . . . to customer specifications.

INDUSTRIAL CARBIDE TOOL CO., Inc.

33 Harmon Street WORCESTER 8, MASS.

bar in the center of the tool slide holder. Moving in line with the machine axis, the headstock collet clamps the bar at the rear of the guide bushing. Two or three axial toolholders for drilling, threading, and centering are in front of the headstock. This equipment plus the automatic movements permits machining of intricate parts within very close limits.

One manufacturer features a high-precision screw machine intended for turning parts up to 7 mm in dia (17/64 in.). Working accuracy is guaranteed to within 0.00004 to 0.00012 in. according to the type of work. Inspection has shown that at each operational cycle the main tools recede to within 0.000004 in. of their original position. Of similar design, an automatic lathe produced by another firm is provided with five independent tools, two horizontal tools being mounted on independent swinging supports. Interesting features include: an accelerator for rapid return during unproductive motions, or for small, similar parts of differing lengths, a hydraulic return for the headstock, rapid clamping and release of collet, together with a number of special attachments which improve the range.

Developed recently is a high-precision machine having six radial cutters, each tool carried on an accurate, independent slide. Working accuracy is improved by the increased ratio between tools and cams which this design permits. Most attachments are arranged for mounting on a horizontal base, insuring rapid interchangeability and accurate alignment. This manufacturer supplies an automatic screw machine for producing quality wood screws with a generated, milled thread.

Application of the movable-headstock principle to an automatic lathe of large capacity—previously limited to the smaller sizes—is noteworthy. A headstock of prismatic design, moving on two Vees produces a very sturdy unit. Three cutters apiece are carried by the two carriages which, by their rapid vertical motion, quickly move each cutter successively to the working position. The turret is equipped with six tools, some of which rotate for rapid turning or thread-

More ways to solve tooling problems . . .

BLACK & DECKER
the world's most diversified line of Portable Electric Tools!

By *standardizing* on Black & Decker Tools, The Fingles Company of Baltimore, Md., has saved time and money on scores of jobs like those shown here. As a custom sheet metal shop, Fingles needs versatile tools to handle a wide range of jobs in the shop and on outside installations. Black & Decker "universal" tools give them this versatility —plus expert repair service from a convenient B&D Factory Service Branch to keep their tools in top production form.

Black & Decker builds over 100 Electric Tools —*more* tools, *more* models than any other manufacturer. And *every* B&D Tool is quality-built, engineered and powered to *turn out better work, with less effort, at lower cost!* Let your nearby B&D Distributor show *you* where you can cut costs by standardizing on Black & Decker, as thousands of other companies have done. Write today for our detailed catalog to: The Black & Decker Mfg. Co., 616 Pennsylvania Ave., Towson 4, Md.

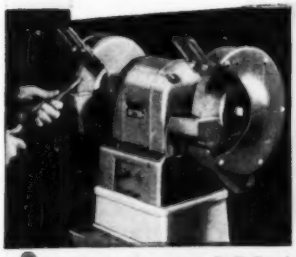
LEADING DISTRIBUTORS EVERYWHERE SELL

Black & Decker
PORTABLE ELECTRIC TOOLS

Clean-cutting B&D Electric Porto-Shear, cutting 20-gage stainless steel here, has cutting action always visible.

Versatile B&D 7" Heavy-Duty Sander sands cabinet corner. Same tool grinds, wire brushes, planes wood.

B&D Electric Hammer, shown here drilling in tile for installing toggle bolts, drives many kinds of tools.



The Fingles Co. uses a B&D Bench Grinder for grinding down welds, beveling edges on stainless steel, sharpening tools.

B&D Drill Stands give extra leverage, extra precision. This ½" Drill and No. 60 Drill Stand are drilling a ½" hole in an angle iron frame.

Perfectly-balanced B&D 4" Portable Grinder grinds weld on exhaust fan collar.

B&D Electric Tapper tapping holes in 11-gage cabinet. B&D line also includes 19 Screw Driver and Nut Runner models for speedy assembly.

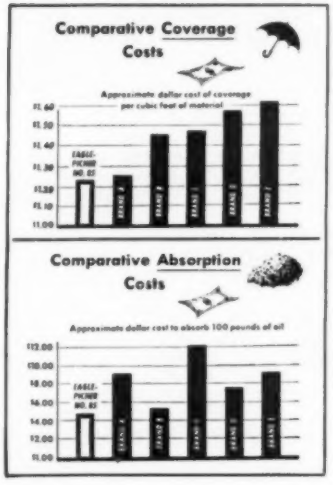
B&D ½" Standard Drill drilling holes in 10-gage frame. Other B&D Drills from ¼" to 1¼", in Standard and Heavy-Duty models.

Standardize on BLACK & DECKER for . . .

- Wide choice of tools, wide choice of models.
- Quality-built features like powerful B&D-built motors, each "tailor-made" for the tool it drives.
- Convenient interchangeability of parts.
- Expert service on replacement parts and repairs from any one of 28 B&D Factory Service Branches.
- Sound advice on tooling problems from a nearby B&D Distributor.

Here's proof

Eagle-Picher Floor-Dry No. 85 gives you *More for your dollar!*



Comparative scientific tests show that Eagle-Picher Industrial Floor-Dry #85 outperforms the five other leading brands of floor drying compounds.

Eagle-Picher Industrial Floor-Dry #85 is a granular mineral compound—chemically inert, non-combustible and insoluble in oil, grease, kerosene or water. It can give you positive reduction in operating costs plus greater safety. Write for complete information.

Packed in convenient 50-pound, multi-wall Kraft paper bags.

The Eagle-Picher Company

GENERAL OFFICES: CINCINNATI (1), OHIO

The Eagle-Picher Company
Department AM-79
Cincinnati (1), Ohio
Gentlemen: Please send me complete information about Eagle-Picher Industrial Floor-Dry No. 85.

EAGLE EP PICHER

Name _____

Address _____

City _____ *County* _____ *State* _____

ing operations using differential speeds. Non-productive movements are performed with a minimum of lost time. Parts 2 5/16 in. dia. and up to 21⅝ in. long may be turned with this machine—a new size achievement for precision automatics. The work area is completely enclosed.

Fixed Headstock Types

Notable among the fixed-headstock type are the turret automatic lathes. Of larger capacity, their accuracy permits their use in place of regular turret lathes. One such machine will take bar work up to 2½ in. in dia and chuck work to 7 in. A very simple device speeds the change from bar to chuck work. Featured with this machine is a set of standard cams which permit machining different parts with the same set of cams. Tooling expense is reduced and setup time eliminated, so that small batches of precision parts may be run off economically. It is not necessary to have idle machine time between long runs. Working accuracy is 0.0008 in. or better, according to machining conditions.

Two machines complete the series. The first is single-spindle, fixed-headstock automatic turret lathe comprising five radial toolholders. One toolholder has a longitudinal motion plus independent swinging barstop limiting the length of the machined parts. A six-tool turret faces the work spindle, providing (with the feed on independent stop), twelve working possibilities. Turning operations may be performed, together with other axial and lateral operations.

The second machine is a *vertical* automatic lathe for bar work which utilizes six work spindles capable of six simultaneous machining operations. Each spindle is equipped with a radial carriage or with an inclinable lengthwise carriage on three of the six stations. Vertical bars provide reduced floor space and minimum vibration.

Swiss industry offers a wide range of automatic machines applicable, with advantage, to small-lot production. Additional information is available from The Swiss Association of Machinery Manufacturers, Zurich, Switzerland.

CROSS UNIVERSAL GEAR MACHINES *for*

- ROUNDING
- CHAMFERING
- POINTING
- BURRING

Cross Universal Gear Machines embody advanced engineering developments to obtain highest productivity and assure lowest possible operating costs.

They feature utmost flexibility for handling a wide variety of gears. Continuous cutting motion, exclusive with Cross, speeds production at top efficiency.

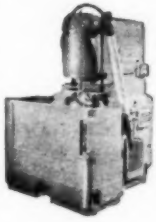
Special skill is not required because machines are automatic and push button controlled. Power clamping is foot pedal controlled. Both hands are free for work handling.

No. 55

For rounding, pointing, chamfering or burring external and internal:

spur gears
helical gears
clutches
splines

Typical productivity when rounding or pointing 8 pitch 30 tooth gears is 55 net hourly.



No. 65

For pointing or chamfering external and internal:

clutches
spur gears
bevel gears
splines

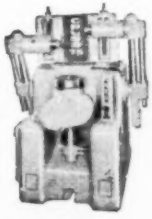
Typical productivity when pointing 10 pitch 30 tooth gears is 100 net hourly.

No. 75

For burring or chamfering both ends at the same time.

helical gears
spiral bevel pinions
hypoid pinions

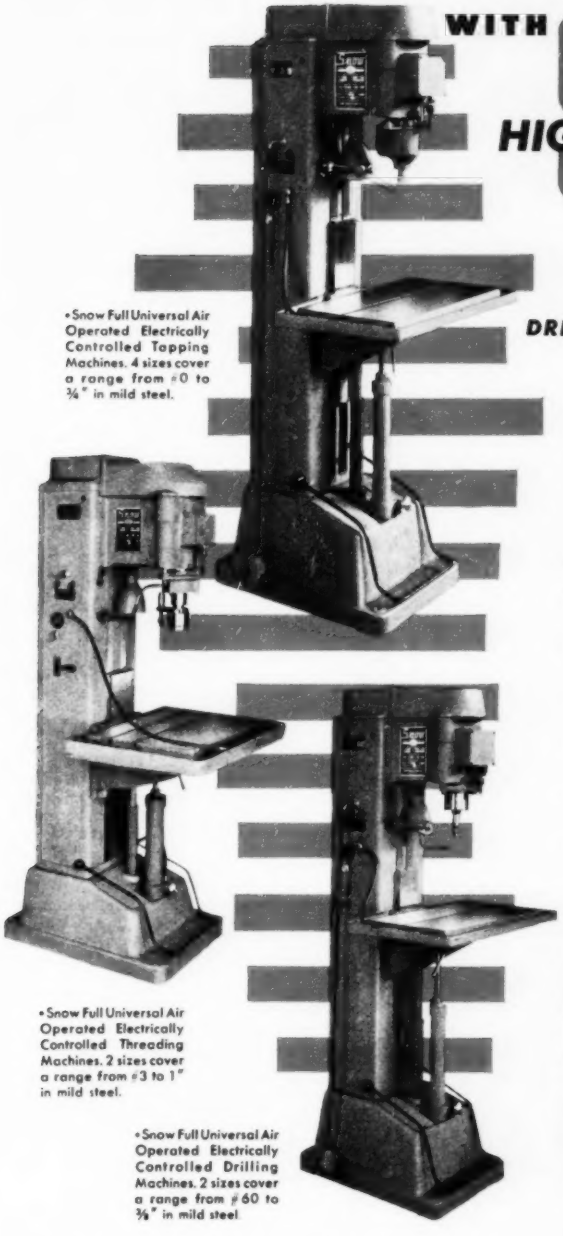
Typical productivity when chamfering 8 pitch 40 tooth gears is 200 net hourly.



THE CROSS COMPANY
Established 1898
SPECIAL MACHINE TOOLS
MILLING • DRILLING • TAPPING • BORING
TURNING • SHAPING • GRINDING • HONING
DETROIT 7, MICHIGAN

MEET SOARING PRODUCTION COSTS

WITH SNOW HIGH SPEED TOOLS!



• Snow Full Universal Air Operated Electrically Controlled Tapping Machines. 4 sizes cover a range from #0 to ¾" in mild steel.

• Snow Full Universal Air Operated Electrically Controlled Threading Machines. 2 sizes cover a range from #3 to 1" in mild steel.

• Snow Full Universal Air Operated Electrically Controlled Drilling Machines. 2 sizes cover a range from #60 to ⅜" in mild steel

AIR-OPERATED ELECTRICALLY CONTROLLED DRILLING, TAPPING AND THREADING MACHINES

•Today's severe competition will be worse tomorrow. It cannot be met with yesterday's machine tools. The new Snow Full Universal Air-operated, Electrically Controlled Drillers, Tappers and Threaders are the answer for maximum production of small parts. •Typical of advanced design and amazing performance is the Snow Full Universal Drilling Machine (bottom left). Drill sets its own rate of feed for increased output and greater tool economy. In thousands of installations it has demonstrated capacities of 6000 pieces per hour. Numerous types of Snow air-operated indexing and clamping fixtures and jigs are available for instant synchronizing to the machines. Our engineers will gladly study your parts and blue prints and submit highly profitable suggestions. Send for data on *all* these Snow machines.

Snow

HIGH PRODUCTION DRILLING, TAPPING, THREADING, NUT TAPPING, 2 SPINDLE, HORIZONTAL MACHINES, DRILL PRESS TAP HEADS, JIGS AND FIXTURES

SNOW MANUFACTURING COMPANY 439 EASTERN AVE., BELLWOOD, ILL. (SUBURB OF CHICAGO)

FIRTHITE CARBIDE TIPS
FOR CUTTING TOOLS
ALL SIZES, SHAPES AND GRADES AVAILABLE

SEND FOR YOUR New Catalog Sections NOW!

STANDARDS
SEMI-STANDARDS
MODIFIED STANDARDS
MODIFIED SEMI-STANDARDS

YOU CAN DO IT
better, faster, cheaper—
with Firth Sterling

The use of Firthite (sintered carbide) Tips and Blanks for Cutting Tools provides *better* finishes—makes possible the cutting of so-called unmachinable materials and holds to closer tolerances on long runs.

Firthite Tips and Blanks achieve *faster* production—more rapid removal of material—higher output in less time. This results in *cheaper* production because of longer tool life—more continuous performance—less regrinds.

Firthite Tips and Blanks come in all forms and grades to meet every demand of the metal working field. Get in touch with a Firthite Sales Engineer to discuss tooling your machines with Firthite.

Firth Sterling
STEEL & CARBIDE CORPORATION, McKeesport, Pa.
Offices and Warehouses in Hartford, Philadelphia, Cleveland, Detroit, Chicago, Dayton and Los Angeles.
Offices in New York and Pittsburgh.
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R-169

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STEEL & CARBIDE CORPORATION
McKeesport, Pa.

☐ Please send me a copy of the *new* Firthite Tips and Blanks Catalog, Section "60-000".
☐ I would like to discuss Carbide Tooling with a Firthite Engineer.

Name _____ Title _____
Company _____
Address _____

Names in the News

Cecil M. Peter, for nearly 11 years general sales manager of The Fellows Gear Shaper Co., Springfield, Vt., has been named vice president and general manager. Other appointments: **Leroy C. King,** sales manager; **Herbert W. Nickerson,** eastern district manager, assisted by **Fred Pauling; Ralph Lane,** Boston area representative; **Ralph Aiken,** Syracuse territory; **George Sanborn,** manager of Detroit office, retaining his title as chief field engineer; **Frank Sanborn,** West Coast sales; **Carl Rice,** assistant to Mr. George Sanborn in field engineering.

Ray P. Powers has been named manager of quality control for the Lincoln-Mercury division of Ford Motor Co., Detroit. He is a veteran of more than 25 years in the automobile business, a member of the American Society of Tool Engineers and the American Foundrymen's Assn.

Howell L. Potter has been named chief engineer, The Fafnir Bearing Co., New Britain, Conn., succeeding **Harry R. Reynolds,** who has been appointed consulting engineer.

R. C. Friedly has been named central states regional manager, Nelson Stud Welding div., Morton Gregory Corp., Lorain, Ohio.

Harold Sargeant has been named manager of General Electric Co.'s Trenton, N.J., Works, in addition to his duties as manager of manufacturing for GE's home laundry equipment division. **Harry Kilbey,** former manager at Trenton, has been named superintendent of the Bridgeport Works of the division. **Wilfred L. Breault** has been named manager of manufacturing of the electric sink and cabinet division, succeeding **Harry J. Gerlach,** retired. **Harold E. Strang,** engineering manager of the Affiliated Manufacturing Companies Dept., has been named manager of the Apparatus Dept.'s meter and instrument divisions at Lynn, Mass. **W. F. Rauber** has been named manager of sales for the switchgear divisions, Apparatus Dept., succeeding **J. D. Hoffman,** named sales manager for the air conditioning and commercial refrigeration division of the Air Conditioning Dept.

Bryan E. House has been appointed general manager of the Timken-Detroit Axle Co.'s brake division at Ashtabula, Ohio, succeeding **Ray L. Morrison,** now with American Swiss Co., Toledo.

REDUCE COSTS TO *The Bone...*

Illustrated below is one example of Baush Cost Reduction Engineering.

Our Engineers are available to work with you, at no obligation, on your production problems. . .

Baush High Speed two-way horizontal type machine equipped with a five station trunnion type hand indexing fixture arranged to accommodate two (2) work pieces at each station while performing drilling, redrilling, semi-finish reaming and line reaming of cross pin hole in die castings.

Rate: approximately 400 pieces per hour. Baush 20F (floor-type) hydraulic units are utilized.

SPECIFICATIONS

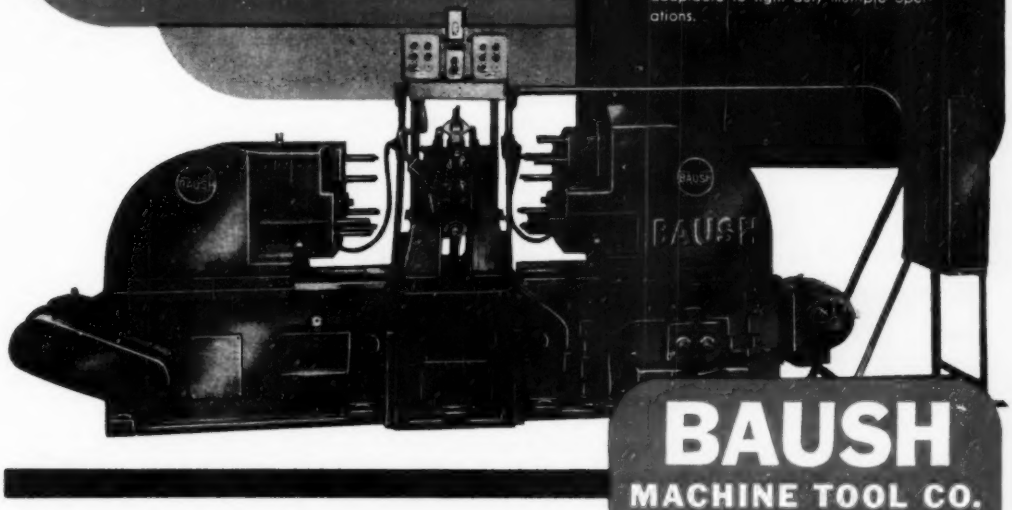
Left hand unit furnished with 6 spindles. Right hand unit furnished with 8 spindles, 2 of which are fast reaming spindles.

Hydraulic units furnished with hardened and ground steel ways and 12" maximum strokes.

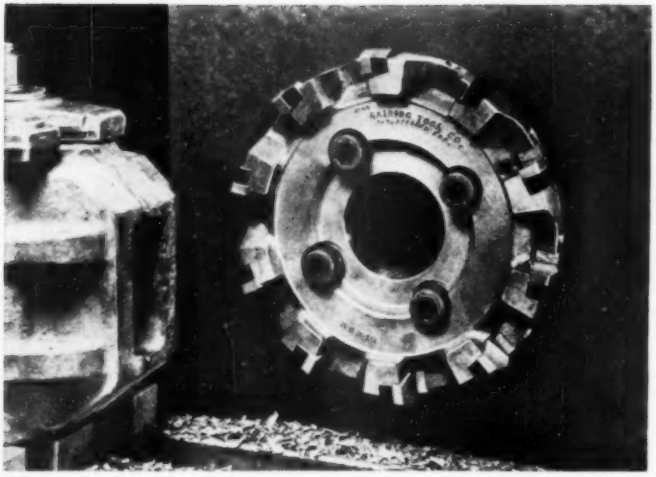
Saddle separate from heads.

Fixture hand indexed with limit switch on index pin to start cycle of heads.

Note: This type of unit is especially adaptable to light duty multiple operations.



BAUSH
MACHINE TOOL CO.
SPRINGFIELD 7, MASSACHUSETTS



Standardize on E-CON-O-MILL!

Gairing Standard Carbide Face Mills Save Costs in Shops Large and Small

- BUY ONE E-CON-O-MILL, and not only do you get a highly efficient cutter of rugged construction, but you also can order finish-ground replacement blades ready to be slipped in place and go to work in a matter of minutes. The same cutter can thus be equipped with blades having the proper carbide and the most efficient cutting angles to mill cast iron, steel, or non-ferrous materials.

- BUY SEVERAL SIZES OF MILLS, and you add the advantage that the same blades may be used for all. Blades are clearly branded and individually cartoned. It takes no great skill to re-sharpen them individually on an ordinary grinder with the aid of our new combination grinding fixture and checking gage.

- The more you "STANDARDIZE ON E-CON-O-MILL," the greater the savings to you. One large E-Con-O-Mill user reports that the saving in the cost of diamond wheels alone is reason enough never to go back to any other type of face mill.

The GAIRING

E-CON-O-MILL

PATENT APPLIED FOR

For full description and prices ask for illustrated E-Con-O-Mill catalog.

Available from stock in sizes 5- to 16-inch diameter

THE GAIRING TOOL COMPANY, 21226 Hoover Road, Detroit 32, Michigan

J. F. Lewis, formerly in charge of production and purchasing at the Peoria, Ind., plant of Hyster Co., Portland, Ore., has been named chief production engineer. He will supervise parts and service, manufacturing engineering, tool design, and inspection in Hyster's three factories. **Theron Howard,** head of tractor sales and service in the eastern division, will succeed Mr. Lewis at Peoria.

R. W. Steere, Jr., has been named assistant chief engineer of Plymouth Motor Corp., Detroit, replacing **A. W. Ross,** who has been transferred to an executive assignment with Chrysler Corp's central engineering division. Mr. Steere moves up from his position as chassis engineer.

James C. Wilson has been named chief engineer of Terrell Machine Co., Charlotte, N. C., succeeding **Thomas W. Wilson,** resigned. He was formerly with Pratt & Whitney as aircraft engine design engineer.

W. L. Hubbard has been elected president of Norma-Hoffman Bearings Corp., Stamford, Conn., succeeding **C. P. Collins,** resigned.

Ralph H. Heberling, vice president in charge of manufacturing of Edward Valves, Inc., East Chicago, Ind., has retired.

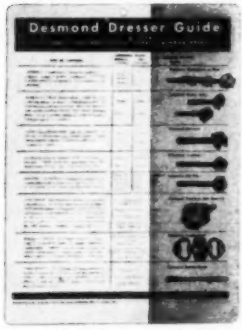
Curtis C. Gary has been named assistant to the president of the brake shoe castings division of American Brake Shoe Co., New York. **John F. Ducey, Jr.,** and **Sam R. Watkins** have been named district sales managers of the division. Mr. Ducey is in the New York office, Mr. Watkins in the Cleveland office. **Roger W. Batchelder** has been appointed vice president in charge of sales of the National Bearing division. He was formerly assistant to the president of National Bearing.

James H. Jewell, manager of apparatus sales, and **John M. McKibbin,** assistant to vice president and manager of advertising and sales promotion, have been elected vice presidents of Westinghouse Electric Corp., Pittsburgh. **Herbert P. MacDonald,** treasury manager in the company's eastern district office, New York, was elected assistant treasurer, and has also been appointed credit manager. Vice President **L. E. Osborne,** primarily an operations official heretofore, has been assigned staff supervision over all the company's manufacturing activities, including all matters of production and industrial relations. Simultaneously he retains operating responsibility for five major manufacturing divisions. **John K. Hodnette,** vice president and head of the transformer division at Sharon, Pa., has been named general manager of industrial products.

practical tips...

on faster grinding

For smooth finish on average or fine grain wheels of medium and large sizes, use Desmond-Stephan Dressers with the corrugated cutters. For 10" to 15" OD wheels, specify size no. 1; for wheels over 15" use size no. 2.



You'll get better performance and longer life from all your grinding wheels if you keep them dressed and trued with Desmond dressers. Only Desmond makes a complete line of dressers. And now Desmond offers you a free convenient "Dresser Guide to Better Grinding," an easy to read, two-color, 9" x 12" wall chart for use in tool rooms, shops, and tool cribs.

Ask your industrial distributor for this valuable new *Guide to Better Grinding* or if he cannot supply one, write us direct.

The DESMOND-STEPHAN MFG. CO., Urbana, Ohio

Desmond

the only complete line of grinding wheel
DRESSERS & CUTTERS

Three good ways to reduce your gage block costs

You can go a long way toward lowering your "break-even" point just by keeping an eye on the many tremendous trifles in your manufacturing costs. Take gage blocks, for example. The price you pay for even the best is insignificant compared to the savings they make possible. Assured sustained accuracy of production! More efficient inspection. Fewer rejects. Yet here are three good ways to cut this basic cost of precision:

1 **Get longer wearing millionths with**
ELLSTROM CHROMIUM PLATED GAGE BLOCKS

They give you 5 to 20 times longer wear than ordinary blocks, yet they cost but very little more. Unconditionally guaranteed to specified millionths. Rated "tops" for all-around gage block quality.

2 **Maintain the accuracy of your basic standards through**
ELLSTROM INSPECTION SERVICE

Rejects can raise cain with costs. So it's false economy to let your gage blocks become worn beyond their specified millionths. Let Ellstrom inspect your gage blocks periodically . . . and replace them as required . . . to assure constant "block-by-block" accuracy.

3 **Save up to 20% on new blocks through the liberal**
ELLSTROM EXCHANGE PLAN

When you need new blocks, don't scrap your old ones. Trade 'em in! They're worth up to 20% on the "W" purchase price of new ones under Ellstrom's Exchange Plan.

New ELLSTROM Catalog of Standards!
Contains complete specifications and prices on standard Ellstrom Gage Block Sets . . . plus full details on Ellstrom's Inspection Service and Exchange Plan. Write for your copy today!

Ellstrom... *measuring in millionths for 3 generations*

DEARBORN GAGE CO. 22035 Beech Street Dearborn, Michigan

Originators of Chromium Plated Gage Blocks

Do you recognize these HOLTITE fastenings? Guess what industry uses each of them. Check yourself by the list below.

CONTINENTAL makes them all and thousands more

Of all the 400,000 varieties of fastenings that literally hold our industries together, Continental makes a large proportion marketed under the famous HOLTITE trade name. Most of them are standard — screws, nuts, and bolts for every use in every industry. Others like the well-known HOLTITE-Sems and HOLTITE-Phillips screws are patented specialties and the famous HOLTITE-Thredlock, Locktite and Tap screws were first designed and produced by HOLTITE. Sometimes a fastening engineered by HOLTITE for one industry finds an unexpected use in another. Often a HOLTITE-*Engineered* fastening will replace several parts that a manufacturer is using. Why not discuss your fastening requirements with a Continental Sales-Engineer. He will focus on your requirements all the broad industrial-fastening experience and ingenuity of Continental. Remember Continental is constantly improving HOLTITE products, lowering their cost and broadening service.

ENGINEERED FASTENINGS FOR PRODUCT ENGINEERS

A. This chrome plated Phillips screw used on passenger guard rails in busses has a special shaped head to dress up appearance and provide additional shear resistance.

B. A special shoulder on this unusual HOLTITE Phillips motor bus seat adjusting screw assures snug, rattle-free fit between vehicle body and driver's seat.

C. The Phillips head on this special HOLTITE-Sems bolt speeds initial driving. The hex head allows use of a torsion wrench for final adjustments and repair in the field. This unique design cuts assembly time on truck chassis by several minutes.

D. An example of a HOLTITE "Lock-Tite" screw. The screw and lock washer come in one solid piece. With but one part to handle, assembly steps up and waste drops to a minimum.

This Trademark HOLTITE T. M. REG. U. S. PAT. OFF. *means made by—*

CONTINENTAL SCREW COMPANY

1904 NEW BEDFORD, MASS., U.S.A. 1949

Charles W. Acker has been named assistant factory manager of Chrysler Corp.'s New Castle, Ind., plant. **Havy Carender** has been named master mechanic at the New Castle plant.

Robert S. Fleshiem has been named assistant to the executive vice president of Allis-Chalmers' general machinery division, Milwaukee, succeeding **J. D. Greensward,** recently named general manager of the company's Norwood, Ohio, works. **Roy M. Casper** has been named manager of the company's electrical department, succeeding Mr. Fleshiem. **Ora F. Metz,** district manager of Allis-Chalmers' El Paso and Phoenix offices, has retired after nearly 43 years with the company.

Charles C. Cheyney and **Arthur M. Kiely** have been elected directors of Buffalo Forge Co., Buffalo, N.Y. Mr. Cheyney continues in his position as sales manager. Mr. Kiely continues as controller of the company.

William Van C. Brandt has been appointed managing director of the Electric Industrial Truck Assn., Long Island City, N.Y. He has resigned his position as manager of railway and motive power sales for The Electric Storage Battery Co., Philadelphia, to accept the new post. Succeeding Mr. Brandt as vice president of EITA is **M. W. Heinritz,** vice president of Gould Storage Battery Corp., Trenton, N.J.

Frank J. Wood has been named chief plant engineer of the fabricating division of Permanente Metals Corp. He will administer the engineering program for the production of Kaiser aluminum at the firm's new foil mill at Permanente, Calif., the new rod, bar, cable and wire plant at Newark, Ohio, and the sheet, strip and plate mills at Spokane, Wash.

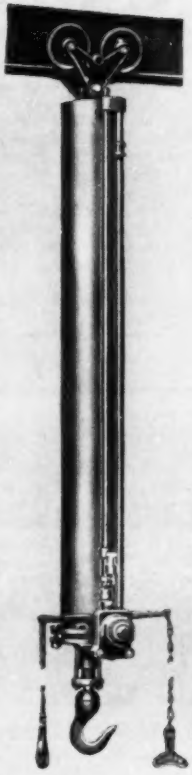
Frank H. Fanning has been elected vice president in charge of operations of Armco Steel Corp., Middletown, Ohio. Other officials elected are L. F. Reinartz and R. S. Gruver, assistant vice presidents, and C. G. Davies administrative assistant of the operations division.

George V. Luerssen, chief metallurgist for the Carpenter Steel Co. has been presented with the first annual David Ford McFarland Award by the Penn State Chapter of the American Society for Metals.

H. Robinson Hyde, assistant to the vice president in charge of production, National Screw & Mfg. Co., Cleveland, has been named production manager, succeeding **Samuel M. Washabaugh,** who has been named manager of sales promotion.

CURTIS AIR CYLINDERS

Increase Plant Efficiency—Decrease Production Costs



Curtis Air Cylinders for lifting, lowering, pushing or pulling

GIVE YOU—

- Smooth, fast, accurate control of loads
- Capacities exceeding 10 tons
- Finger-tip control—one-man operation
- All-steel construction
- Immunity to overloads
- Low first cost, lowest operating expense
- Indoor and outdoor service

It will pay you to investigate Curtis first

95 Years of Successful Manufacturing

CURTIS

PNEUMATIC MACHINERY DIVISION
of Curtis Manufacturing Company
1924 Kienlen Avenue, Saint Louis 20, Missouri

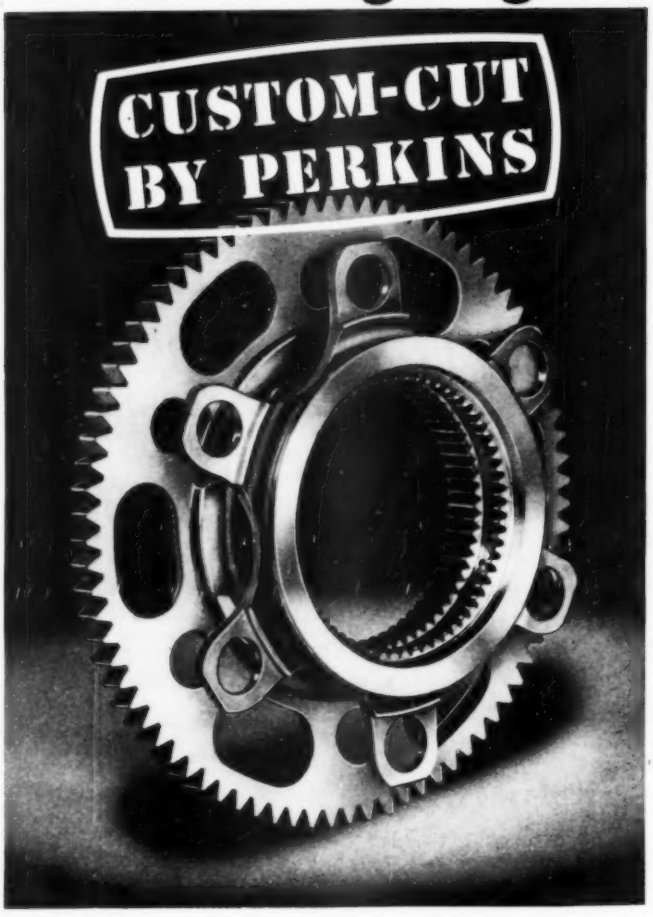
Curtis Pneumatic Machinery Division of Curtis Mfg. Co. 149-3
1924 Kienlen Ave., St. Louis 20, Mo.

I am interested only in items checked below:

☐ Air Hoists
☐ Air Cylinders
☐ Air Compressors

Name.....
Firm.....
Street.....
City..... Zone..... State.....

AIRCRAFT engine gears



The highly complex gear shown here, is an example of the exacting production jobs entrusted to us regularly by many of the country's leading manufacturers of aircraft engines. Moreover, our ability in the field of gear engineering extends into practically every industry. Thus a vast amount of *all* types of equipment in use right now has been built at less cost and operates more efficiently because Perkins' engineers checked the customers' blueprints and specifications prior to manufacture.

Broad experience both in the application and manufacture of all types of gears has equipped our staff to bring to your project a highly specialized knowledge of power transmission problems.

For the manufacture of the highest quality gears in production quantities, consult PERKINS first.

PERKINS MAKES—in all materials, metallic and non-metallic—Helical Gears, Bevel Gears, Ratchets, Worm Gears, Spiral Gears, Spur Gears with shaved or ground teeth, Ground Thread Worms

PERKINS MACHINE & GEAR Co., West Springfield, Mass.

James W. Hepburn has been named assistant manager of the Vertical Turbine Pump Div., Worthington Pump & Machinery Corp., Harrison, N. J. He will make his headquarters at the Denver Works.

J. A. Zapf, president and general manager of Schultz Die Casting Co., Toledo, has been named chairman of the board. Replacing Mr. Zapf as operating head of the company is **R. A. Luedtke.**

J. G. Schaefer has been named manager of the Youngstown, Ohio, district office of Allis-Chalmers, Milwaukee, **Carter B. Hart** has been named New England region dealer supervisor.

F. O. Dutton has been named director of purchases of the E. W. Bliss Co., Toledo.

W. G. Arnold has been appointed works manager of General Electric Co.'s Fitchburg, Mass., works. Responsibility for all Works Services and allied functions formerly assigned to the G-E Lynn River Works service divisions has been transferred to the Fitchburg Works to be under Mr. Arnold's direction. He will continue in his present capacity as manager of manufacturing for the two G-E divisions, turbine and welding, located at Fitchburg.

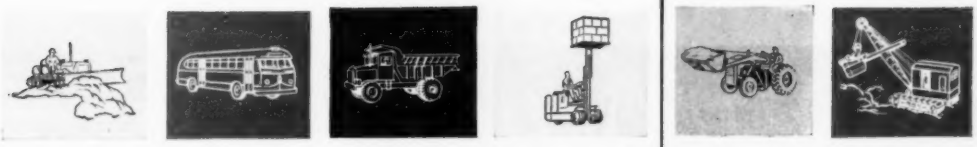
Obituary

J. J. Freney, 46, industrial division manager of General Electric's Philadelphia apparatus sales office, died suddenly of a heart attack recently. He joined the GE organization after his graduation from Catholic University in 1924. Two years later he was transferred to the switchgear factory in Philadelphia, and in 1929 went to Pittsburgh where he spent six years in the industrial end of GE's sales organization. Transferred to the Philadelphia office in 1935, he was made industrial division manager in 1948.

Business Items

Yoder Co., Cleveland, plans to expand its present 300,000 sq ft of manufacturing space in its five buildings by one third when construction costs recede. Expansion will be made on property presently owned by the company in the W. 55th & Walworth Ave. areas.

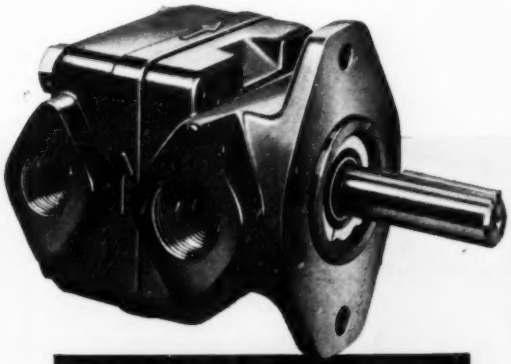
Hyde Spring & Wire Co., Detroit, will establish a branch plant for the manufacture of industrial and agricultural springs at Lisbon, Ohio, having purchased the building formerly occupied by Wright File Co.



the pump designed SPECIFICALLY FOR mobile equipment service

the NEW series V-200

VICKERS
BALANCED VANE PUMP



THE ONLY PUMP THAT AUTOMATICALLY MAINTAINS CORRECT RADIAL AND LATERAL CLEARANCES AT ALL TIMES

The rigorous job requirements of construction, agricultural, automotive and materials handling machinery have long pointed out the need for a hydraulic pump expressly designed for this service. The new Vickers V-200 Balanced Vane Pump has been designed and developed to meet these requirements with the usual Vickers high quality workmanship . . . all adding up to the "Best Pump Value" for this industry.

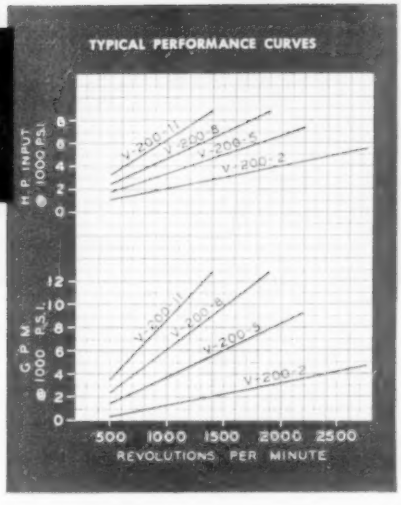
Longer life at maximum efficiency, far in excess of fixed clearance pumps, is assured as the Vickers Pump is the only pump designed to maintain both radial and lateral running clearances at all times. Not only is normal wear perfectly compensated, the pump even automatically adjusts its clearances to oil viscosity variations resulting from temperature change. As a result, correct clearances are maintained and more oil is delivered for useful work.

For many installations the nominal rated capacity of the pump is adequate, making it unnecessary to select the next larger size to provide additional capacity to compensate for loss due to high operating pressures, increased temperatures or normal wear. Thus, in many cases, a smaller pump can be used resulting in a more compact, efficient, and economical installation.

The tried and proven Vickers feature of "hydraulic balance" eliminates bearing loads resulting from pressure. The vane principle provides for no-load starting . . . important in cold weather cranking. Greater mounting adaptability is another advantage.

For better service, much longer life, with maximum efficiency all the way . . . you need Vickers V-200 Pump on your mobile equipment. Write for Bulletin 49-52.

AVAILABLE IN FOUR CAPACITIES WITH THE SAME EXTERIOR DIMENSIONS



Write for NEW BULLETIN 49-52

3905

VICKERS
Incorporated
DIVISION OF THE SPERRY CORPORATION
1410 OAKMAN BLVD. • DETROIT 32, MICHIGAN

Application Engineering Offices: ATLANTA • CHICAGO CINCINNATI • CLEVELAND • DETROIT • LOS ANGELES • NEWARK PHILADELPHIA • PITTSBURGH • ROCHESTER • ROCKFORD ST. LOUIS • SEATTLE • TULSA • WASHINGTON • WORCESTER

VERSATILE
Heavy Duty Gage Blocks
Webber 5IN
Webber 1-500
Assembled in a few seconds
Extra large gaging surface
Sturdy, rigid build-ups
Low in cost
Details upon request
CARBLOX CARBIDE
ANGLE BLOCKS
STANDARD STEEL BLOCKS
H. D. BLOCKS and FIXTURES
Webber
GAGE COMPANY
12901 TRISKETT RD.,
CLEVELAND 11, OHIO
LARGEST EXCLUSIVE MANUFACTURER OF PRECISION GAGE BLOCKS
LATEST PRICE LIST
Webber Gage Blocks
STANDARD STEEL BLOCKS B Accuracy ± .000008"
88-B4 block set $235.00
43-B3 block set 150.00
38-B8 block set 155.00
STANDARD CARBIDE (CARBLOX) B Accuracy ± .000008"
82-B2 block set $1,175.00
33-B3 block set 495.00
Carblox Wear Blocks .100" set of 2 with case 21.50
For price list on Standard Steel and Carbide A blocks (accuracy ± .000004") or special blocks, write or wire.
ANGLE GAGE BLOCKS
16A 16 blocks $450.00
HEAVY DUTY GAGE BLOCKS AND FIXTURES Accuracy ± .000005"
36 H.D. $450.00
24 H.D. 385.00
WEBBER GAGE COMPANY
12901 Triskett Road • Cleveland 11, Ohio

Newport Steel Corp. is the new name of the former International Detrola Corp. General offices are in Newport, Ky.

Acme Chain Corp., Holyoke, Mass., has acquired 7000 more sq ft of floor space in the former American Writing Paper Corp. paper mill. Acme was recently merged with Industrial Chain Co., Inc., West Springfield, Mass., and is moving that plant to its enlarged space in Holyoke.

Colonial Broach Co., Detroit, has established a completely equipped production broaching division. The department is equipped with several Universal horizontal broaching machines, a group of vertical press type machines of various capacities, and a number of round, keyway and spline stock broaches.

Independent Pneumatic Tool Co., Aurora, Ill., has constructed new factory branch sales and service buildings in Chicago at 1405 West Washington Blvd.; in New York at 32-34 Greenpoint Ave., Long Island City; in Pittsburgh at 204 Thomas St., and in Toronto, Canada, at 1909 Davenport Road.

Borg-Warner Corp's Superior Sheet Steel Division, Chicago, having served its purpose of supplying other plants of the parent corporation with more than 100,000 tons of steel during the shortages of the past two years, has discontinued operations indefinitely.

Warner & Swasey Co., Cleveland, has moved its New England district office from Cambridge to 20 Chestnut St., Needham, Mass. The company's Buffalo office has been moved from the Iroquois Bldg. to the Vars Bldg., 344 Delaware Ave.

Air Reduction Co., New York, has opened a new oxygen plant in Flint, Mich., built at a cost in excess of $250,000. The plant will produce more than 4-million cu ft of oxygen per month to serve industrial needs of Flint and surrounding areas. This plant will also be an acetylene gas supply point and a store room for welding equipment and supplies.

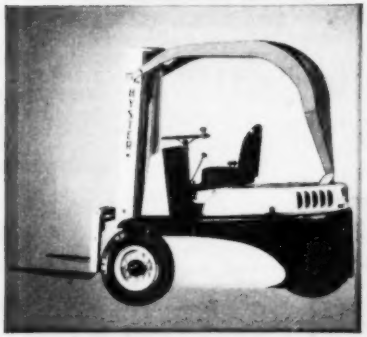
American Steel & Wire Co., United States Steel subsidiary, has opened a new stainless steel wire producing will with a 500-ton-a-month capacity at its Waukegan, Ill., works.

Koppers Co., Inc., Pittsburgh, has been awarded a Republic Steel Corp. contract for construction of a new battery of byproduct coke ovens and material handling facilities at Republic's Youngstown, Ohio, plant. A battery of 65 koppers ovens to replace the present No. 2 battery at Youngstown, as well as major additions to the coal and coke handling system, are included in the project. The ovens will be capable of carbonizing 1505 tons of coal per day.

THE BEST LIFT TRUCK FOR INSIDE WORK

MOVE MORE MATERIALS

Inside your plant with a HYSTER® LIFT TRUCK



The complete Hyster line of trucks—7 models (2,000 lb. to 30,000 lb. capacity) are gasoline powered; all are equipped with pneumatic tires. Illustrated at top of page is Hyster 20; above, Hyster 40.

Saves Floors...Cuts Maintenance Costs. More Speed, More Traction, More Maneuverability.

The Hyster Pneumatic Tire "Easy Ride" is easy on floors—easy on the load—engineered for greater maneuverability in narrow aisles and crowded warehouse spaces. HYSTER IS THE IDEAL LIFT TRUCK FOR INSIDE WORK.

Big PNEUMATIC TIRES CUT DOWN FLOOR SURFACE REPAIRS, practically eliminate damage to costly floors. TRACTION and RAMP CLIMBING ability is increased. Operator fatigue is reduced.

Your Hyster Distributor will demonstrate a Hyster 20 (2,000 lb. capacity) or a Hyster 40 (4,000 lb. capacity) for your *inside and outside* materials handling jobs. You can check your own savings. SEE FOR YOURSELF or write for literature.

HYSTER COMPANY

THREE FACTORIES

2902-14 N. E. CLACKAMAS STREET . PORTLAND 8, OREGON
1802-14 NORTH ADAMS STREET . . . . . PEORIA 1, ILLINOIS
1010-14 MEYERS STREET. . . . . DANVILLE, ILLINOIS

UNITCASTINGS —
are *Accurate* castings . . . all the way

The increased demand for greater accuracy in steel castings is being met at Unitcast. Consistently high quality, upheld by rigid standards, makes Unitcastings *fit* customers' specifications from contour to physical properties . . . *accurate all the way!*

Typical of the methods that control the quality of Unitcastings is illustrated above. This periodic check on a molding operation is only one of 55 similar "inspections" along the production line that assures accuracy in Unitcastings!

The advantages of Unitcast's modern methods can be applied to your steel casting problems. A few minutes time with a Unitcast representative may prove valuable toward cost reduction! Write today! Unitcast Corporation, Steel Casting Division, Toledo 9, Ohio. In Canada: Canadian-Unitcast Steel, Ltd., Sherbrooke, Quebec.

UNITCAST
Corporation
ELECTRIC STEEL CASTINGS

Nichols Wire & Aluminum Co., Davenport, Iowa, has been elected to membership in The Producers' Council.

Bridgeport Brass Co., Bridgeport, Conn., has opened a new sales office in the Dwight Bldg., Kansas City, Mo., under the direction of James G. Miller.

General Electric Co.'s $25,000,000 jet center at Lynn, Mass., will enable engineers to study jet engines nearly four times as powerful as those now in production.

Ward Steel Co., Boston, completed construction of a new 5,000 sq ft one-story warehouse in Chicago for distribution of tempered and polished spring steel to serve users in Illinois, Indiana, Wisconsin and states west of the Mississippi River.

Mid-West Abrasive Co., Owosso, Mich., has bought the main plant of the Michigan Sugar Co., Owosso, to rehabilitate for company use in line with future expansion of the company's operations.

Automatic Transportation Co., Chicago, has established a factory branch sales office and a service station and parts depot in New York City. The sales office is at 347 Madison Ave.; the parts depot at 1749 York Ave.

The National Supply Co., Pittsburgh, has formed The National Supply Co. of Venezuela C.A., with headquarters in Caracas, to represent Venezuelan interest of the company as well as those of its British associate, The Oil Well Engineering Co., Ltd., England.

Tinnerman Products, Inc., has moved its Detroit district offices to 14550 Third Ave.

Hydraulic Equipment Co., Cleveland, is expanding its sales organization and is establishing sales offices on the West Coast.

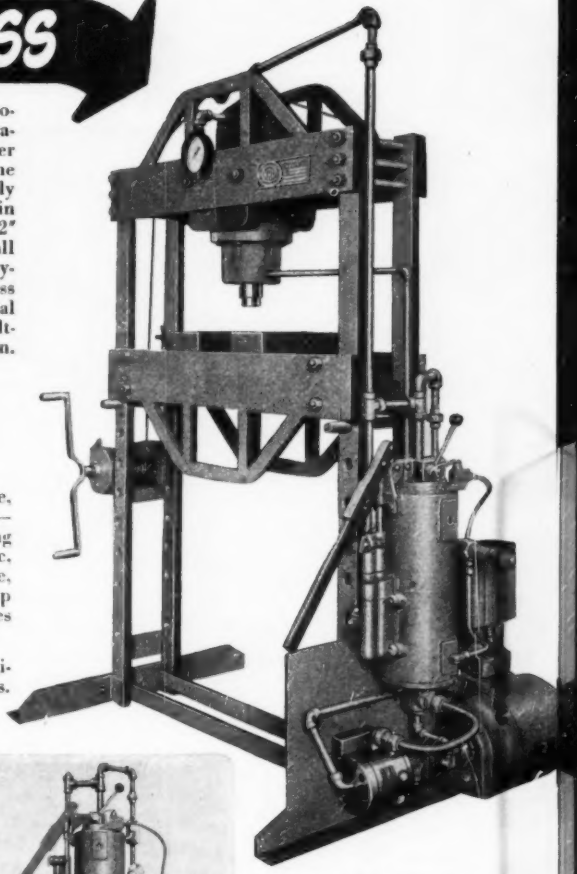
Link-Belt Co., Chicago, has announced the following office changes: The Cleveland office is now located at 314 Hanna Bldg.; The Baltimore office has moved to 2315 St. Paul St.; the Huntington, W. Va., office is now located at 1009 Fifth Ave.; the Newark, N. J., office is now at 212 Essex Bldg., 31 Clinton St.

Rohm & Haas Co., Philadelphia, has signed a contract with the U.S. Army Ordnance Dept. to organize and operate a laboratory for basic research and development in rockets and jet propulsion. The project will be located at the Army's Redstone Arsenal near Huntsville, Ala.

E. W. Bliss Co., Toledo, will now carry on design and manufacture of its single and double crank presses up to 250-ton capacity, and certain semi-automatic can machinery at its plant in Hastings, Mich.

LOOK AT THIS PRESS

It's designed to provide industry with low-cost, high production units that are highly flexible in design and operation . . . relieving heavier presses of short runs and lighter work. Presses are practically fool-proof in operation. Frame is extremely rugged. Fingertip controls are conveniently located at hand level. Available for immediate delivery, in standard width (between uprights) of 24″—31″—36″—42″ respectively. Available in special width up to 72″ at small additional cost. Movable bed plates. Pumping unit has by-pass relief valve which can be set at any pressure up to press capacity. Presses available for either vertical or horizontal operation. *All Standard* presses equipped with 2-speed built-in hand pumps for more sensitive and versatile operation.



READ THESE "SPECS":

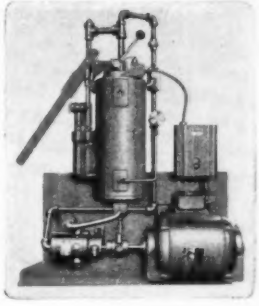
CYLINDERS: *Standard Models* furnished with 6" bore, 7½" stroke—spring return type; also 5" bore, 7½" stroke—spring return type. Above presses are *standard.* Following can be furnished at additional cost: Double Acting, 6" bore, 7" stroke; 6" bore, 11" stroke; 5" bore, 7" stroke; 5" bore, 11" stroke. Special long stroke cylinders also available, up to 48" in length, for incorporation in suitable press frames of our make.

PUMPING UNITS: These units can be supplied in various volumes and pressures, in a total of 13 combinations.

Presses include V blocks, Gauge, Motor Controls, Pressure Regulator, etc., complete and ready to attach to electrical source.

CHECK THESE USES:

There are so many everyday production uses for these versatile KRW Hydraulic Presses that we have lost count. Here are a few of the more obvious . . . blanking, forming, bending, broaching, straightening, stamping, embossing, numbering, upsetting, laminating, pressing and hot or cold forging. KRW Engineers are daily developing other uses. If you have only a vague idea of how these presses might be used in your plant, let us have it in a rough form. We'll do the rest.



MODERNIZE AND MOTORIZE YOUR PRESENT KRW PRESS with one of these compact motor drive units. They come complete ready to connect to your press. Require very little extra floor space. Write for conversion unit prices, giving the capacity and serial number of your press.

BEAT THESE PRICES*:

Depending upon capacity of pumping equipment, prices of Standard model motor driven hydraulic presses are as follows, F. O. B. Factory: 25-ton press from $727.00 to $992.00. 50-ton press from $806.00 to $1058.00. 60-ton press from $1070.50 to $1135.00. 75-ton press from $1198.00 to $1258.00. All motors in the above units are 220/440 volt, 3 phase, 60 cycle. Any change in motor specifications is extra. **Subject to change without notice.*

MAIL THIS COUPON

It will bring you all the money-saving facts about these low cost, high production hydraulic presses. Now is the time to get ready for the highly competitive days ahead.

K. R. WILSON, 215 Main St., Buffalo 3, N. Y.

Please send me complete information on KRW Motor Driven Presses as follows:

☐ 25-ton ☐ 50-ton ☐ 60-ton ☐ 75-ton presses

☐ motor drive conversion unit ☐ Press Cap.

Serial No. .....

Name .....

Address .....

City and Zone ..... *State* .....

K·R·WILSON

215 MAIN ST. · BUFFALO 3, N. Y.

EX-CELL-O CAN PRODUCE THEM . . .

. . . Parts To Your Specifications In The Exact Volume You Require

Within its extensive organization Ex-Cell-O has exceptionally complete and modern facilities for machining, heat treating, sub-assembly and inspection, in addition to an engineering staff widely experienced and ready to serve you in solving your parts problems. Ex-Cell-O's manufacturing skill represents the most improved methods for producing your parts—from rough stock to finished piece. Ex-Cell-O, with all these facilities under one roof and one responsible management, offers many economical advantages. To get the best in quality and economy in parts, why not send a part print to Ex-Cell-O in Detroit? Write today.

XLO

To learn more about Ex-Cell-O's modern and complete parts production facilities, send for Ex-Cell-O Bulletin No. 36151.

EX-CELL-O CORPORATION DETROIT 32 MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS
DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

48-28

MACHINES MADE LIGHTER, MIGHTIER, WITH REYNOLDS ALUMINUM

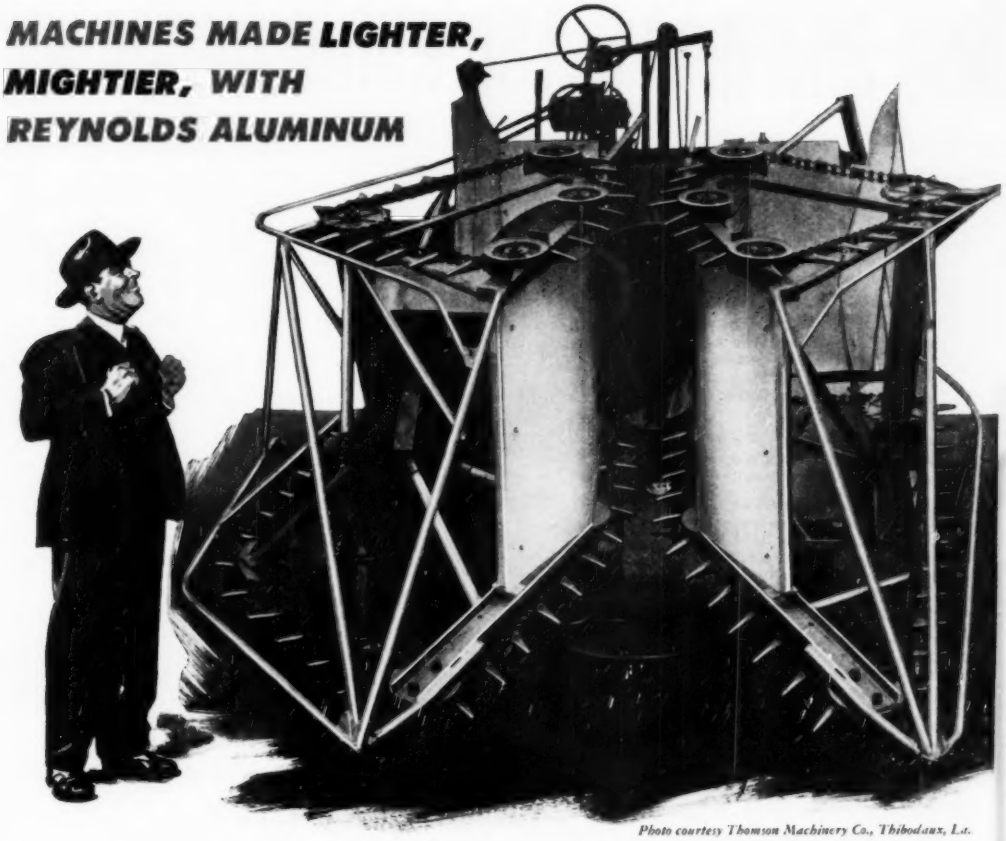


Photo courtesy Thomson Machinery Co., Thibodaux, La.

MUCH of the cost of raising sugar cane is in the cutting. The cane harvester in the picture above used to be overweight, had trouble getting over wet ground until aluminum replaced many heavy parts.

The manufacturer redesigned with aluminum—used aluminum bar and structurals in the frame work, replaced cast iron gear cases with strong, heat-treated aluminum castings. In fact, nearly 30% reduction of dead weight was made without sacrifice of strength. This allowed more engine—30 hp was added—never attainable with heavier metals. Now more cane is cut faster and harvest costs are lower, because lighter aluminum enabled the making of a mightier machine.

Here's proof of the part aluminum can play in improving your product. There are many kinds of aluminum that do many different jobs, better. Aluminum lets you forget rust, gives you a metal that's easier and faster to handle; it's strong even though ⅓ the weight of other metal. You can save on finishing cost—aluminum's bright natural finish stays bright. Shipping costs are less and sales appeal is tops. You can have all these benefits in extrusions, structurals, sheet, screw machine stock, wire, rod, bar and special shapes—in a wide range of alloys and tempers.

To get the lift of aluminum for your product, get the help of Reynolds experienced technicians. Call the nearest Reynolds Office, listed under "Aluminum" in the classified section of your telephone directory, or write to Reynolds Metals Company, Aluminum Division, 2523 South Third Street, Louisville 1, Kentucky.

ALUMINUM STRUCTURAL DESIGN

Send your request for this informative book on your company letterhead and receive your copy without charge.

REYNOLDS *Lifetime* ALUMINUM

CONSIDER ALUMINUM—CONSULT REYNOLDS—A COMPLETE ALUMINUM SERVICE

Mill and drill in the same chucking

Two high production drilling and tapping machines use a new 5 hp milling attachment

In one chucking of the housing 5 tools operate. One tool is a TC-tipped milling cutter, 5.5 in diam. It cuts at the rate of 1.9 cu. in. per min.

In 2 chuckings of the throttle body 31 tools operate. Two tools on the same arbor are TC-tipped milling cutters. A 2 in. cutter mills one boss in the second chucking. A 2.5 in. cutter mills 2 bosses in the first chucking.

The principle is not new. For years we have used milling attachments on drilling units with ½ to 3 hp motors.

But the milling attachment on these 2 machines is new. It is so heavy and rugged it needs 2.2500 diam. guide rods. (Our other attachments use 1.0000 or 1.3750 diam. rods.) It usually takes a 5 hp motor. Both jobs here are well within its capacity.

With this 5 hp milling attachment you can mill fairly heavy cuts in the same chucking with drilling, reaming, tapping and other operations. You can finish the part in fewer chuckings. You know the benefits of fewer chuckings —

More output per man hour
Accurate relationship of operations
Less handling and less floor space
Result: better product at lower cost

Unit costs in pennies

Man and machine cost 9/10¢ for all 5 operations on the housing. Man and machine cost 4-6/10¢ for all 31 operations on the throttle body. Here is the basis: 1) 80% efficiency, 2) the machine to pay for itself after operating only 6000 hours, a fraction of its useful life, 3) the present national average wage rate. No power or overhead.

Speaking of low costs, that reminds us of a story. One of our dealers called us the other day. "About our order so-and-so for a new Kingsbury," he said. "They are putting on the heat for a better delivery. Until they get that new machine, they say it costs them 10¢ too much to build each car."

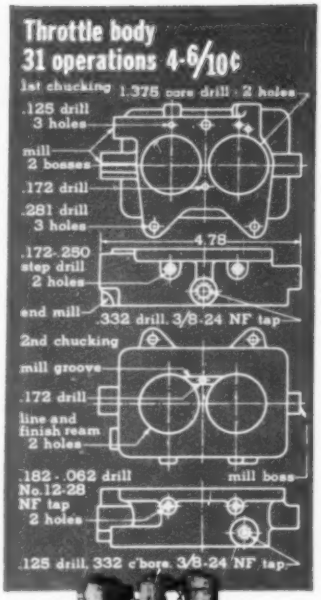
Our sales manager told this 4 times before he reached the "expediter."

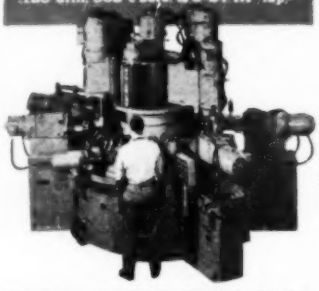
Do your parts cost too much?

When you look for automatic machines to cut your costs, may we quote too? Send a print to our Mr. L. A. Carll. Tell him the operations and hourly output you need. We believe our proposal will merit your consideration.

Sincerely yours,

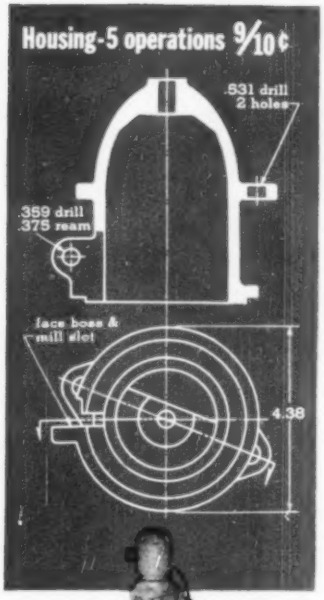
Kingsbury Machine Tool Corp.
50 Laurel St., Keene, N. H.





302 PARTS AN HOUR GROSS. On this 60-inch automatic indexing machine, 16 units do 31 operations on 4 sides of the throttle body in 2 chuckings.

- **On the central column are 10 vertical units. Only 8 show. After we made the photo the owner needed 2 more operations. We installed 2 units in the space we provided on the front of the column.**
- **Knees attached to the base support 6 horizontal units. (Originally 5 units: one more added later for a new operation.)**
- **A power wrench opens and closes the fixtures. (The man stepped aside so you could see it. That is why he does not look busy.)**
- **Ball bearing bushings guide the 1.375 core drills and line reamers. Regular bushings in piloted carriers guide the 13 other drills.**



538 PARTS AN HOUR GROSS: You would never guess it from this picture but the cycle is only 5.5 seconds. During this time the man is supposed to remove a finished part and replace it.

- **Operations are from 3 directions — Vertical: A unit with 2-spindle auxiliary head drills the two .531 holes. Horizontal, 45° left of the radial line: A unit with the new 5 hp milling attachment faces the boss and mills the slot with the same cutter. Horizontal, 45° right of the radial line: 2 units drill .359 and ream .375. (A bushing guides the drill.)**
- **The indexing table is 20 inches in diameter and holds 4 duplicate work fixtures.**

86

KINGSBURY

AUTOMATIC DRILLING
AND TAPPING MACHINES
for Low-Cost High Production

SCHERR *aids to precision – production*

- OPTICAL COMPARATORS
- TOOLMAKER MICROSCOPES
- BINOCULAR MICROSCOPES
- COMPARATOR GAGES
- GEAR TESTERS
- HEIGHT GAGES
- ILLUMINATED MAGNIFIERS
- GAGE BLOCKS
- VERNIER CALIPERS
- MICROMETERS
- TACHOMETERS
- SNAP GAGES
- "MAGNE-BLOX" for magnetic-chucks

BULLETINS ON REQUEST

GEO. SCHERR CO., Inc.
200-D Lafayette St. New York 12, N. Y.

FRONT LEVER BENCH PUNCH

Capacity 7/16" hole through ¼" steel or equal.

•

Hand Operated Weight 70 lbs.
Immediate Shipment

•

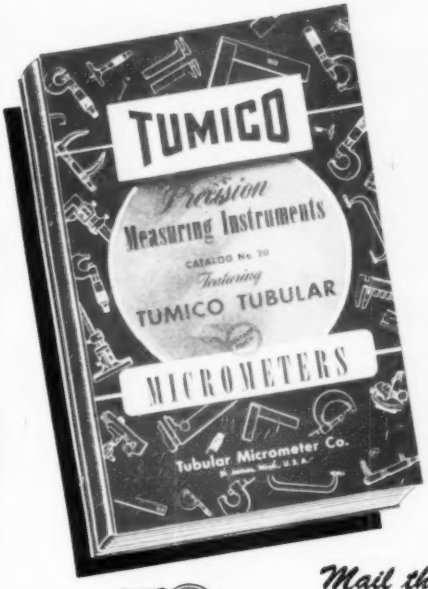
Punches and dies in a large range of round, square, flat, and oval sizes are carried in our New York stock.

•

Send for circulars illustrating and describing our line.

T. H. LEWTHWAITE MACHINE CO., INC.
313 East 47th St., New York 17, N. Y.

What's NEW in Precision Instruments?



- How can one micrometer now handle more jobs than ever before?
- How can your special gaging problems be solved with TUMICO lightweight construction?
- What are the new features for take-up of precision instrument wear?
- How are sapphire and tungsten carbide tips saving time and money?
- What special instruments are available for hard-to-reach places?

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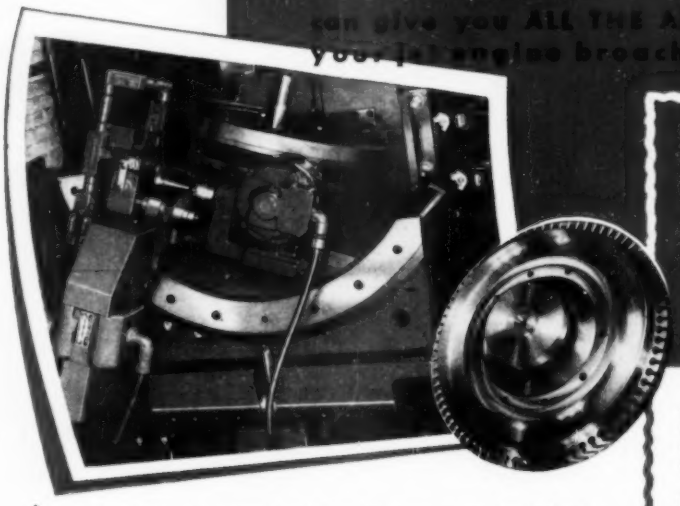
can give you ALL THE ANGLES to solve your jet engine broaching problems!

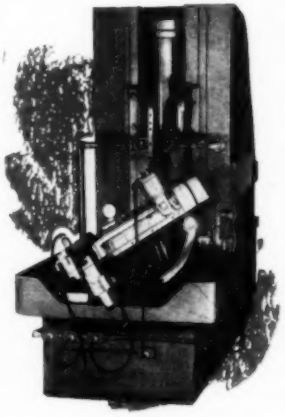


THE "HEART" OF JET ENGINE BROACHING

By the use of change gears, any number of slots can be cut, and at any required angle.

Since there are fourteen different stator segments that are broached on the Lapointe SRV Broaching Machine, the number of equidistant slots and the angle at which they are cut vary greatly.

The Lapointe Universal Fixture eliminates the difficult, time-consuming methods formerly required for holding the work. Now, with this protractor type fixture, a piece can be held in horizontal position or at any angle up to 48 degrees.



Instinctively, the aircraft industry for many years has looked to Lapointe for the most advanced engineering ideas on broaching. This is natural, for Lapointe not only pioneered broaching as an economical machining method but has always led the way in *driving down broaching costs.*

Take these universal fixtures, for example. Designed for holding the large compressor rotors *at compound angles,* they have greatly simplified the entire broaching procedure. Using the sine bar principle, the new Lapointe fixture replaces 12 fixed angle blocks formerly required — thus saving much valuable time when changing from one rotor to another.

Lapointe universal broaching fixtures make it easy for you to develop your ideas as you go along. In jet engine design, where improved efficiency is the constant aim, these universal fixtures are a major asset in helping you to achieve the maximum thrust and the ultimate in power . . . visible indications of an *efficient engine.*

It pleases us that so many of America's large and small production plants are saying: "Lapointe's the way to better broaching!" Write for our special folder describing the Lapointe Single Ram Vertical Broaching Machine. Ask for Bulletin SRV-2.

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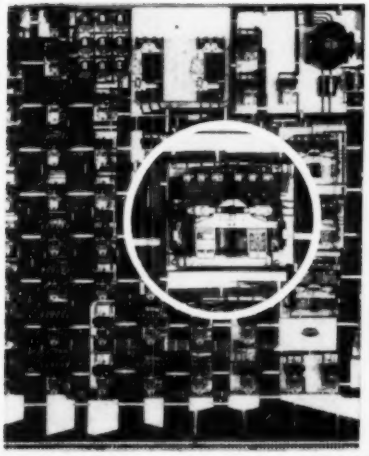
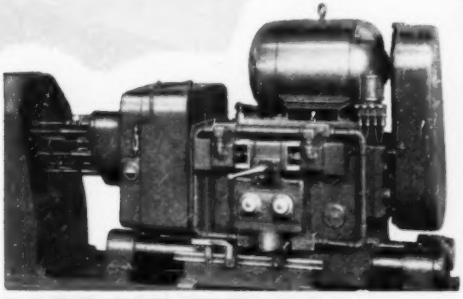


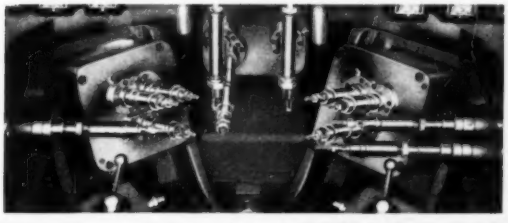
BEAUTY BY THE MILE

Maybe it isn't important that a control panel be beautiful except that in the case of Snyder panels the beauty is the result of the perfect orderliness of the layout. Every circuit can be traced, clearly and easily. Every cycle is protected, when desirable, by interlocks to prevent machine damage through electrical failure. Every panel is provided with manual operation for tool set-up. All conform to established standards. Miles of wire are set into the panels yearly, every inch with such precision and neatness that our panels are notably compact. Building these beautiful panels in our own shop makes us independent of outside delivery dates, gives us close coordination during building and testing each machine and enables us to deliver a better job that saves you money in the long run.

QUICK-CHANGE ARTIST

We think we've done an exceptional job on our standardized component units, used on most of our machines. All units, whether way or guide bar type, have hardened and ground bearing surfaces. They provide any required stroke up to 24", yet, create no problem of overhang on extended stroke, as do ram-type units. They are so adaptable and so well built that they can be re-tooled over and over again thereby delivering substantial savings in machine investment since retooling can give you an entirely different operation at minimum cost. Special units are designed with the same objective—to give you durability and versatility that will save you money in the long run.





YOUR TAPS ARE TOPS IN SNYDER SPINDLES

A good many years ago we satisfied ourselves that the individual lead screw type of tapping head is the most effective means of leading taps into the work and established it as our standard equipment. This method permits proper speed selection for each individual tap; produces a more accurate thread; eliminates the hazard of thread-stripping. Threads of the lead screw are precision ground after hardening. Snyder safety tap drivers are used exclusively to eliminate tap breakage. Lead screw tapping nuts are of the finest bronze and are replaceable. These features have satisfied the precision requirements of ordnance and aircraft work. They will satisfy you and save you money in the long run.

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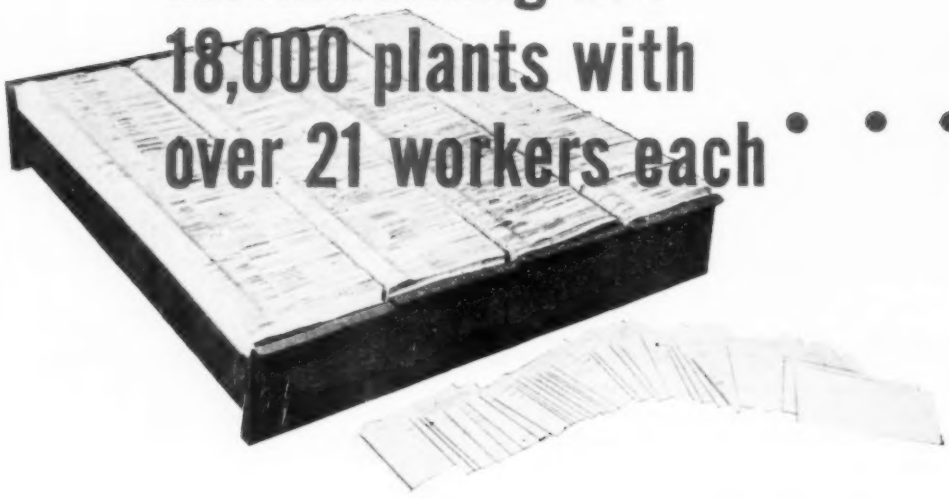

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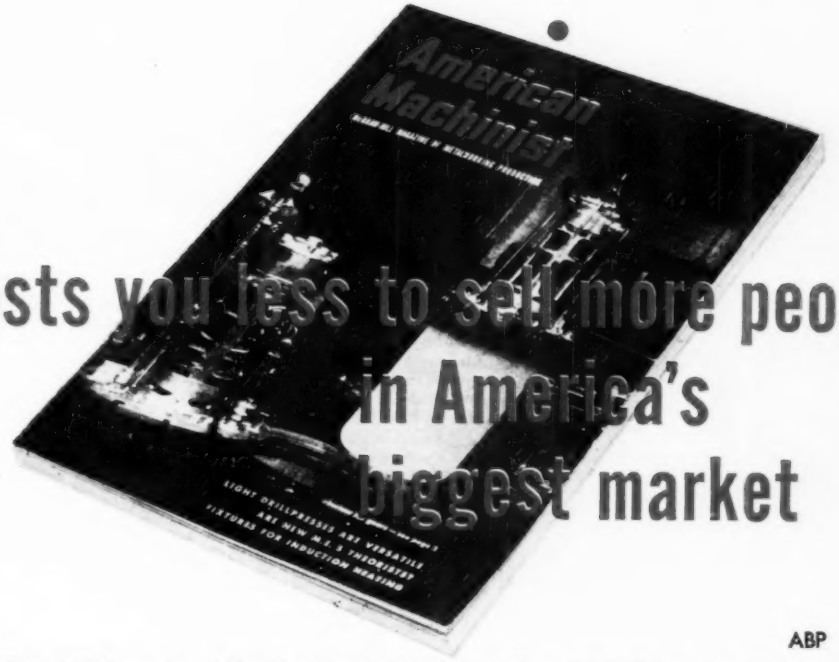

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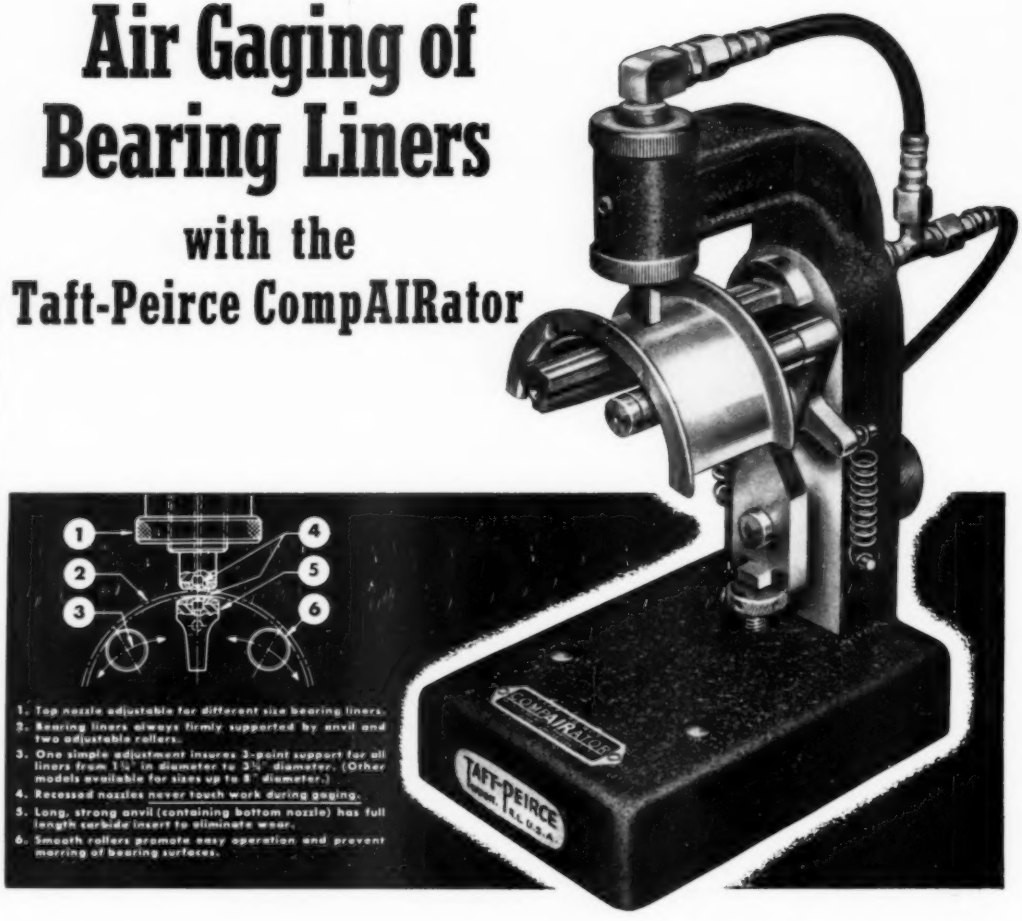
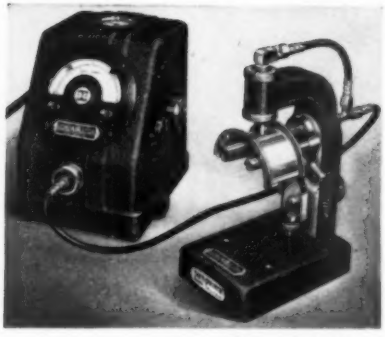
Air Gaging of Bearing Liners

with the Taft-Peirce CompAIRator



1. Top nozzle adjustable for different size bearing liners.
2. Bearing liners always firmly supported by anvil and two adjustable rollers.
3. One simple adjustment insures 3-point support for all liners from 1½" in diameter to 3½" diameter. (Other models available for sizes up to 8" diameter.)
4. Recessed nozzles never touch work during gaging.
5. Long, strong anvil (containing bottom nozzle) has full length carbide insert to eliminate wear.
6. Smooth rollers promote easy operation and prevent marring of bearing surfaces.



Here's another example of the versatility and effectiveness of the Taft-Peirce CompAIRator. It's a special air gaging fixture which we designed to check the wall thickness of bearing liners. When connected to a standard Taft-Peirce CompAIRator, this device provides a rapid and accurate means of exploring the entire bearing area for variance in wall thickness.

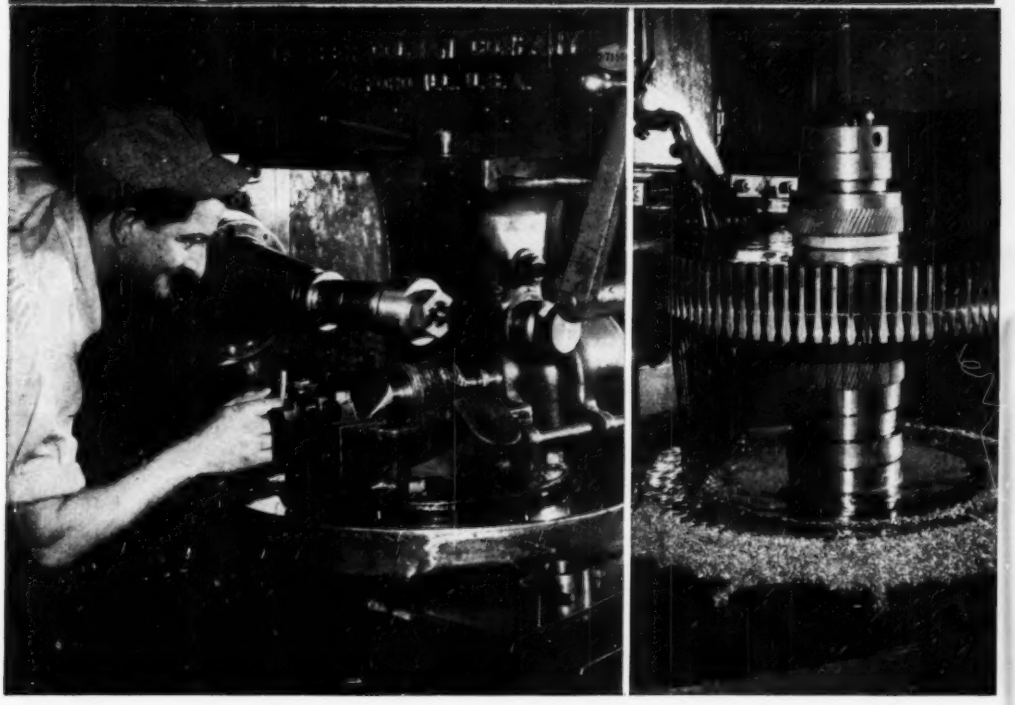
Adjustable for different diameters and wall thicknesses, these fixtures are being adopted for faster and more economical inspection service by leading bearing liner manufacturers. There's no need for clamping, with its attendant delays and distortion, since two recessed nozzles are applied. These never touch the work. Tungsten carbide wear strips assure extensive life.

Maybe some of your tricky inspection problems can be licked by the Taft-Peirce CompAIRator. Our air gaging engineering service is available for analysis of your particular requirements.

For full information, write or phone your local Taft-Peirce representative or address

The Taft-Peirce Manufacturing Company
Woonsocket, Rhode Island

Analyze the whole Picture...



When you select Cutting Fluids

IN SELECTING cutting fluids for your machining operations consider your choice from every angle. Will it increase production? Will it lower production costs? Will it improve finish? Will it meet all other requirements peculiar to your operation?

When you look at the whole picture you'll want to investigate the advantages to be gained by specifying the dependable, service-proved cutting fluids of Cities Service. Such products, for example, as Cities Service Chillo Oils which have been performance tested in scores of machine shops.

Why not let a Cities Service cutting oil specialist help you select the best type and grade for your purpose? His recommendations may bring you substantial improvements in the quantity and quality of your production.

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Write today for our new and informative booklet entitled "Metal Cutting Fluids". Address Cities Service Oil Co., Room 452, Sixty Wall Tower, New York 5, N. Y.

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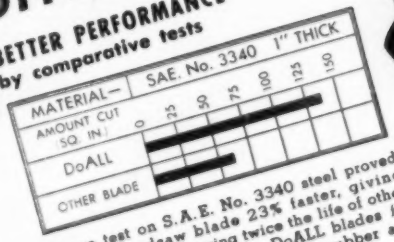
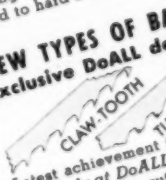


Above test on S.A.E. No. 3340 steel proved DoALL bandsaw blade 23% faster, giving better finish and having twice the life of other bandsaw blade. There are DoALL blades for cutting any material from cloth, rubber and wood to hard metals and even glass!

2 NEW TYPES OF BANDSAW BLADES Exclusive DoALL developments



Latest achievement in bandsaw blades, *available only at DoALL*, are the Claw-Tooth blade (negative angle cutting rake); Diamond-Tooth blade for cutting glass and ceramics; Tungsten-Carbide blade for cutting extremely hard and abrasive materials.

Besides the DoALL-pioneered Buttress or Skip-Tooth bandsaw blades (1942) which revolutionized cutting of soft materials, there are many other superior DoALL bandsaw blades: Precision, Friction, Knife, Scallop and Spiral blades.

3 SAFETY STEEL CONTAINERS Only with DoALL

Steel "strip-out" blade box saves users' time, protects fingers, keeps blade undamaged. Slot shows footage left in box.

Pat. No. D 250,572
Design Pat. No. 127,113
Other Patents Pending

4 DoALL's CUSTOMER SERVICE There's nothing like it!

Coast-to-coast network of factory-trained service engineers (one relatively close to you) available to help solve your sawing problems. Let DoALL determine correct blade, speed, feed, lubricant if any, etc. Write today to start getting benefits of this valuable service.

5 DoALL MACHINES More production, less cost

Because of DoALL's many years of advanced technical research and exhaustive testing on production lines, DoALL Contour Saws are famous in every industry, everywhere. DoALL machines—many models—enable you to bandsaw anything. Write for details on how DoALL "tailors" a saw to fit your job.

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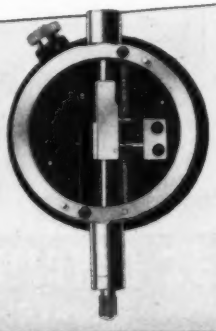

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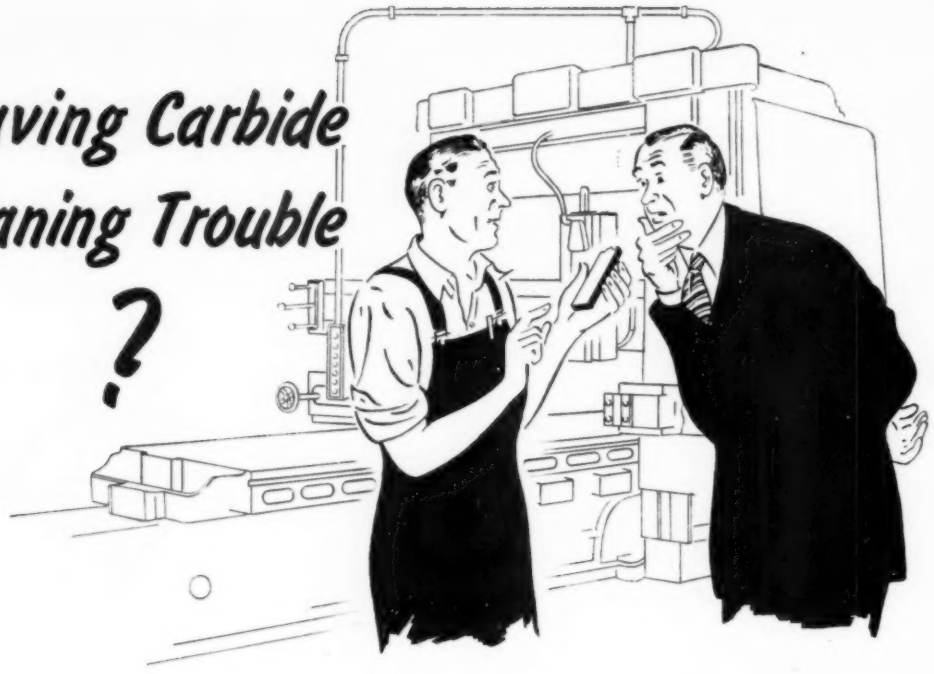

Success or failure in planing with carbides

This book is written to save the Planer user who is converting to carbide cutting tools the delays and experiments that are necessary before arriving at the proper tool for a specific job. The experience, data and examples shown in it have been compiled from carbide planing experiments so that the preliminary steps can be eliminated. The material presented in this book represents the experience in planing with carbides on general purpose work on twenty-two planers ranging from 24" x 24" x 6' to 120" x 120" x 44'. During the past few years the development of carbide tools has reached the stage where metal planing with carbides is both practical and economical.

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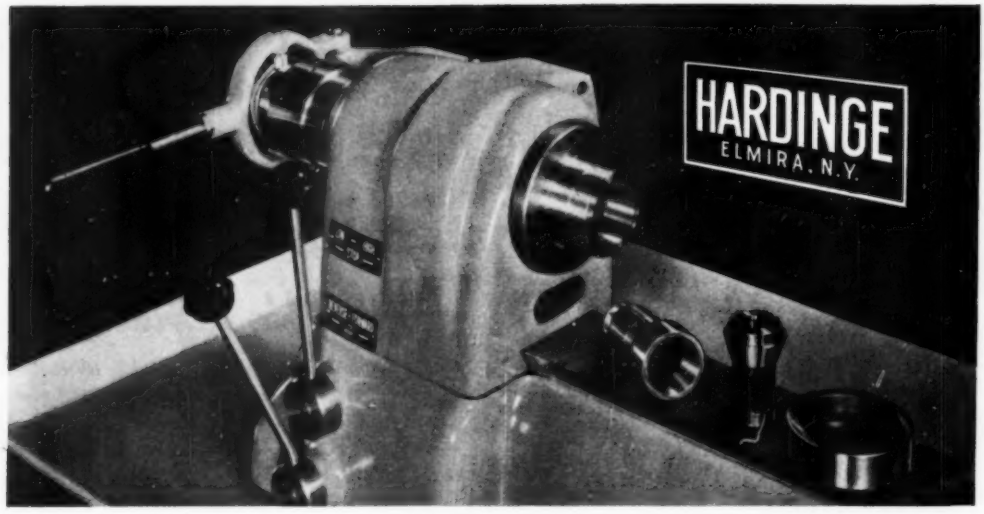

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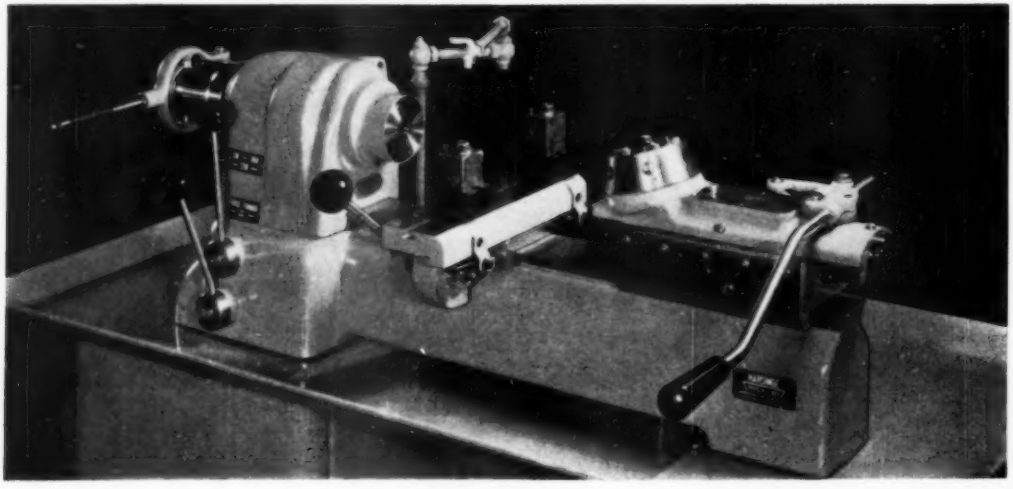

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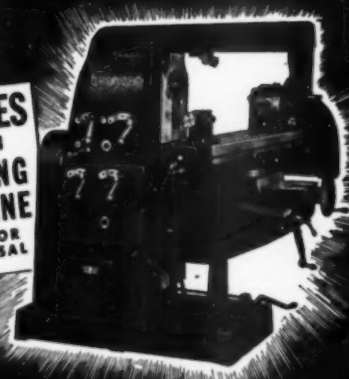

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Yes, you can literally pull lower drive costs "right off the shelf" if you standardize on Ohio Stock Gears for your machines and equipment.

Ohio Stock Gears save money because they eliminate the extra cost of special orders. They save time because they cut out delivery waits. They are ready for you at the nearest Ohio Distributor. They banish costly down-time when replacements are necessary.

You can get Ohio Stock Gears to fit your needs in spur, bevel, helical, worm and worm gear types in 24 to 3 diametral pitch and in miter type from 24 to 4 diametral pitch.

See for yourself how much you can save with Ohio Stock Gears. Get in touch with the nearest distributor today.

ESTABLISHED 1915

THE OHIO GEAR COMPANY

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EARLE GEARS ARE BUILT FOR HEAVY DUTY

Earle Gears are plenty tough—can take hard usage, year after year. Take, for example, the job they are doing on the President Harry S. Truman Bridge in Missouri—or on the Oceanic Bridge in New Jersey.

For years, Earle Gears have proved their ability to give uninterrupted service with a minimum of maintenance on swing, vertical, rolling lift and bascule bridges as well as dams, gates and dredges.

The manner in which they stand up to heavy duty like this is indicative of the service they will give you. Send for our catalog. THE EARLE GEAR & MACHINE CO., 4707 Stenton Ave., Philadelphia 44, Pa. Sales Offices: 149 Broadway, New York 6; 901 Davis Ave., Pittsburgh 12, Pa; 7735 Market St., Youngstown, Ohio.

It's good business to do business with EARLE

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GEAR ECONOMY BEGINS WITH BRAUN

The Braun Gear Company has been shaping the wheels of industry for more than 38 years, producing gears of quality at economical prices. Braun's brand new plant is now more than ever equipped to supply the things that count in gears—precision workmanship, fine materials, good design, and prompt service.

Send samples or prints and specifications for immediate quotations. Whether your requirements are for one gear or thousands, you will find that economy begins with Braun!

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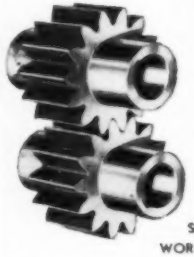
CINCINNATI GEARS

Simplify

Your DESIGN PROBLEMS



Specify Cincinnati Gears, Good Gears Only, and you simplify the problem of fitting gear drives into the crowded spaces allowed on so much of your equipment.

Each Cincinnati Gear is made to meet your particular requirements . . . and to your exact specifications.

We welcome the opportunity of working with you . . . to simplify your design problems.

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WORM • SPROCKET • INTERNAL • *ZEROL
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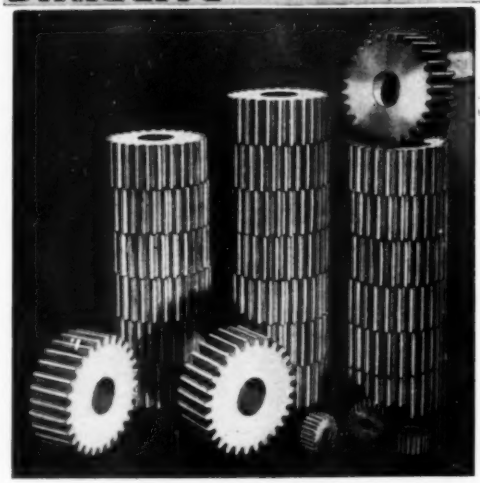
BAKELITE *Silent Pinions*



Get a Stahl estimate whenever you need non-metallic gears. We have long been specialists in this type of gear production, and are equipped to produce on short order bakelite, fabroil, or rawhide pinions . . . in all sizes.

In addition, we are able to give prompt service on metallic gears of all types—spurs up to 6' in diameter; other sizes in proportion.

Write for estimates

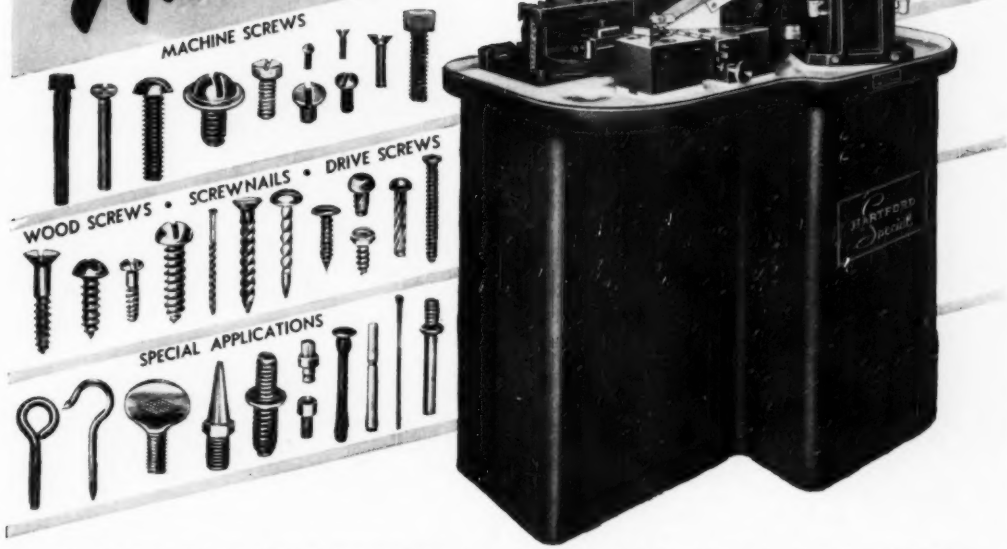
STAHL GEAR & MACHINE CO.
3901 Hamilton Ave., CLEVELAND 14, OHIO

ANNOUNCING

LOW COST — HIGH PRODUCTION

HARTFORD *Special*

Automatic Thread Roller



This Automatic Thread Roller is designed to solve standard and special thread rolling problems on small size screws from .086" to .190" in diameter with thread length capacity from ⅛" to 1½", rolling consistently to Class 3 Thread Fit. Careful engineering and rugged construction make it capable of continued high production runs with startling economy.

The "Hartford Special" Automatic Thread Roller incorporates such outstanding features as Completely Automatic Feed, Filtered Lubrication System, "Table Top" Working Level, Vibration-Free Operation, plus many more.

Our engineering staff is always available to help you work out your thread rolling problems. Write now for complete information.

HARTFORD *Special*

Automatic Drilling and Tapping Machinery • Swaging Machines
Die Polishing Machines • Contract Machine Work • Gears • Cams
"Super-Spacers" • "Four-Point" Milling Vises • "V-Block" Milling Fixtures

THE HARTFORD SPECIAL MACHINERY CO.
287 Homestead Ave., Hartford 5, Conn.

Please send me free Bulletin TR-100 describing your Automatic Thread Roller.

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Company _____

Address _____

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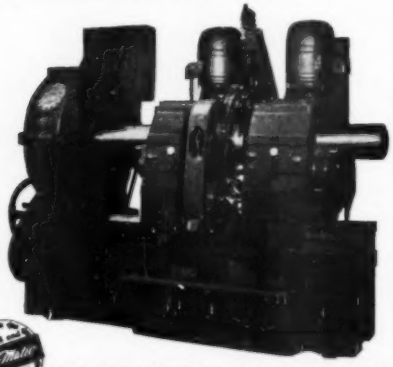
Roto 1-A Matic

HORIZONTAL PRODUCTION MILLERS

FEATURING

1 CONTINUOUS OPERATION
2 AUTOMATIC CHAIN CLAMPING
3 ROUGH & FINISH CUTTERS — EACH HEAD
4 3 TYPES — VARYING BED LENGTHS
5 LOW MAINTENANCE COST
6 INTERCHANGEABLE FIXTURES



INDEPENDENTLY DRIVEN HEADS

No. 1-A ROTO-MATIC Millers have been produced for the past 30 years in various sizes and types to do specific jobs faster and better than they have ever been done before. Because of their flexibility they have been designed to take a wide range of work with uniform satisfactory results. Engineering has made possible the milling of several work pieces at one time giving a high production of each. In all cases exacting requirements as to quality of work have been met.

Chain Clamping Fixture for rough and finish milling both ends of Control Arm Trunions to length. Interchangeable buttons make possible the milling of several sizes — Production 296 gross per hour.

Double Chain Clamping Fixture with a total of 28 stations for milling ends of Clutch Gears — Production 200 gross per hour — With this arrangement two different parts can be milled simultaneously.

Double Drum — 30 automatic holding fixtures on each drum for rough and finish milling radius on Rocker Arms — Production 1400 gross per hour.

ASK FOR BULLETIN 121

DAVIS and THOMPSON CO.

MANUFACTURERS OF *Machine Tools*

MILWAUKEE 14, WISCONSIN

KEYSEATING

The Modern Way

Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1¼" in width.

Great simplicity and ease of operation of Davis Keyseaters assure the user of accurate, time saving work.

Let our engineer study your keyseating problems.

DAVIS KEYSEATER COMPANY

403 EXCHANGE ST. ROCHESTER, N. Y.

Produce your small precision parts with well-known "DERBYSHIRE" accuracy

Illustrated:

The DERBYSHIRE ELECT lathe with 18" bed; ball-bearing headstock with collet closer attachment; double compound rack-and-pinion slide rest with front tool post slide graduated to swivel 360°; six-position turret to take standard tools.

Features and specifications:

Standard ball-bearing headstock, 10,000 RPM; special ball-bearing headstock, 20,000 RPM; chuck capacity .004" to .315"; swing 4.72"; distance between centers: with 15" bed, 5½"; with 18" bed, 8½"; with turret, 6"; standard chuck accuracy, .0002" eccentricity; special chuck accuracy, .0001" eccentricity; turret accuracy, .0005"; maximum turret hole size, ⅝" diameter.

INVESTIGATE TODAY

Write for Catalog

F. W. DERBYSHIRE, INC.

WALTHAM 54, MASS. 157 HIGH STREET

MADISON *BOREAMING

performs miracles with minutes

Madison *Boreaming* drastically cuts time from hole finishing and improves the quality of the holes obtained. Madison *Boreaming* is possible only with the use of the Madison Rough Boring Tool and the Madison Finish Boring Tool. Their features of simple and accurate operation will lower the cost of finished holes and achieve best results when you team them together.

Madison *Boreaming* performed through the use of these two Madison tools will deliver finished holes which usually are achieved only through the use of three to five ordinary tools.

*Completed Boring Operation.

MADISON ROUGH BORING TOOL

In many cases, the Madison Rough Boring Tool will remove as much stock in one pass as an ordinary single point tool removes in three passes . . . and at faster speeds. Madison design assures rough bored holes that are straight and true, and ideally prepared for a better finishing job by the Madison Finish Boring Tool.

MADISON FINISH BORING TOOL

The Madison Finish Boring Tool works to exacting tolerances at high production speeds. The finish obtained is so fine that it seldom requires any additional finishing operation. The cutter may be held rigid or floated in the bar. No special, costly, floating tool holders or chucks are necessary.

Rough Boring Cutter

Finish Boring Cutter

The design features of Madison Finish Boring Cutters have been proven for over thirty years. The same effective features are incorporated in the new Madison Rough Boring Cutter. Both types have the exclusive Madison one-screw adjustment feature. In each cutter the blades themselves form the cutting block. . . . No delicate or loose parts to break, lose, or to complicate adjustment. Having only two blades, there is generous space for chip clearance and coolant circulation. Cutters may be expanded to compensate for wear and regrinding, and are easily sharpened.

FEATURES OF MADISON *BOREAMING

1. Often it is practicable to combine in one bar both the roughing and the finishing cutters, and perform both roughing and finishing in one pass of the tool.
2. A Madison cutter may be slipped from a Madison bar and set to different diameter or replaced by a sharpened cutter in a matter of seconds.
3. The Madison Rough Boring Tool and the Madison Finish Boring Tool are interchangeable in the same setup so that both operations may be performed successively if desired.
4. Madison's two-bladed cutter design has a free cutting action which in most cases permits faster speeds and greater feeds. Less friction means less heat, which in turn results in truer holes with a better finish and also prolongs tool life.
5. The cutter of the Madison Finish Boring Tool may be floated right in the bar. No special floating tool holders or chucks are necessary.

Put *Boreaming* to work for you. Write for the new Madison catalog . . . it shows complete lines, prices, and grinding instructions.

MADISON MANUFACTURING COMPANY
DEPT. AM MUSKEGON, MICHIGAN

Walker Does It Again~

Irregular shapes and close tolerances are no problem to Walker.

Walker Auxiliary Plates make contours and tolerances disappear. Your standard magnetic chuck may be utilized no end by the adaptability of Walker Auxiliary Plates on chucks already in service. Much more economical than costly jigs and fixtures.

Walker gives you the last dollar value from your chucks—the modern way.

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WORCESTER 6, MASSACHUSETTS

Original Designers and Builders of Magnetic Chucks

By EUGENE L. GRANT

563 pages, 6x9, 50 tables, $5.00

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—use the statistical quality control techniques explained in this book. Shows how to use the Shewhart control chart to reduce spoilage and rework . . . to get better coordination in design, production and inspection.

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toughen metal

improve surface

end stock waste

with

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The Torrington Rotary Swaging Machine delivers 4000 hammer blows a minute...reduces, sizes, rounds, points and tapers rod, wire and tubing . . . work-hardens metal for toughness and resilience...produces a burnished surface . . . utilizes every bit of stock.

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Please send a copy of "The Torrington Swaging Machine" to:

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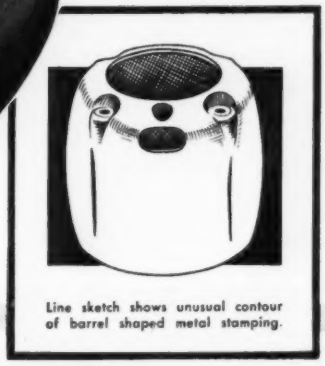

Line sketch shows unusual contour of barrel shaped metal stamping.

AN ACCOMPLISHMENT IN METAL FORMING . . .

An ordinary cylindrical shape presents no particular metal stamping problem. However, to maintain the precise specifications of this barrel shaped body in perfect concentricity presented an unusual and difficult manufacturing problem.

Ribs were provided in the body for strength and to overcome the need for appurtenant reinforcements. Another feature . . . to aid economy in assembling, the bolt head seats were struck flat, eliminating the need for costly machining.

Again Presteel engineering, toolmaking and metal forming techniques made a routine job out of the unusual.

ALLOY STEELS AND OTHER METALS COLD FASHIONED SINCE 1883

Representatives in ALEXANDRIA, VA. • BUFFALO • CANTON, OHIO • CHICAGO DENVER • DETROIT • FORT WORTH • INDIANAPOLIS • LOS ANGELES • NEW YORK PHILADELPHIA • SYRACUSE • TORONTO, CANADA

WORCESTER PRESSED STEEL CO.

807 BARBER AVENUE
WORCESTER 6, MASS.

Tool life greatly increased by reconditioning cutting oil *with*

BARRETT OIL EXTRACTION SYSTEMS

Reports from plants using Barrett Oil Recovery and Reconditioning Systems show surprisingly high percentages in increased tool life. Then, too, users are enthusiastic as to the improved condition of the reclaimed oil as well as the high returns on the investment. Some set-ups in plants engaged on defense production have paid for themselves in a few months.

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With the Barrett system, abrasive-free oil assuring longer tool life can always be depended on. With Barrett Sterilization and Sedimentation equipment, cutting oil is also safe and free from contamination.

Investigate Today by Sending for Descriptive Bulletin of Oil Recovery and Reconditioning Systems

Barrett Centrifugal Oil Extractor—the heart of Barrett Cutting Oil Recovery and Reconditioning Systems.

THE LEON J. BARRETT COMPANY 1800 Grafton Road, WORCESTER, MASS.

Designers and Builders of Centrifugal Machinery

WALTHAM

THREAD MILLING MACHINES

Assure profitable production in threading small parts

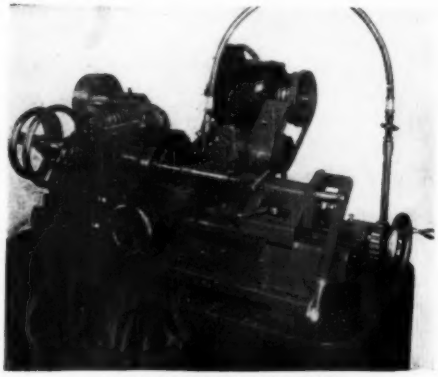
This NEW and improved machine provides semi-automatic milling of accurate, fine-finished threads in diameters of 2" or less . . . at a low cost in time and effort. It is now mounted on a heavy welded steel cabinet in which are located electric control panel and complete coolant unit consisting of motor-driven pump and tank. Chips are held on a removable screen pan. Coolant is returned from top of cabinet base to tank by a readily movable pipe.

Cutter and work spindles are each driven by individual motor. This machine will cut from either brass or steel through a simple change in speed ratios. Cutters for any form of thread can be furnished by Waltham.

Standard equipment includes: point centers for head and tailstock, draw-bar for collet chucks, dog driving plate, 60° V cutter, 13 change gears, indexing device, lighting fixture and follow rest.

With work held on centers, threads 8¾" can be cut. With work held in draw-in collet, capacity is 10" length of thread. Diameter of hole through draw-in collet is ⅝". Swing over carriage is 3".

Write for illustrated literature giving full details.



ATTACHMENTS AVAILABLE

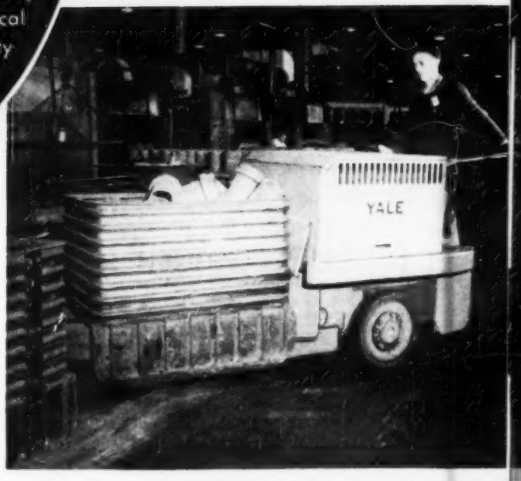
Taper Bar, Lever Chuck Closer, Translating Gears, Climb Milling Device, Internal Cutter Head, Multiple Cutter Head and Collet Chucks.

WALTHAM MACHINE WORKS
HIGH STREET, WALTHAM, MASS.

WALTHAM

this is low-cost handling!

LOW-COST HANDLING is the result of a practical system of material movement integrated with the right kind of handling equipment. Wherever Yale Material Handling Machinery goes to work, permanent economies show up. For instance, a publisher reduced the cost of handling newsprint to less than 1¢ a ton by using Yale Trucks. The cost of shipping operations was cut 75% by a sugar company with the help of similar equipment. Yale Hoists reduced sheet metal handling time from 8 hours to 1 hour for another manufacturer. Such savings indicate the size of your opportunity to cut costs. Increased production, maximum use of vertical storage space, far less worker fatigue and greater safety are other benefits. So—learn how Yale Hoists, Trucks and Scales can bring new efficiency and economy into your handling operations. Phone the nearby Yale representative or write to headquarters.



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TOOLS THAT KEEP INDUSTRY "ON THE MOVE"

THE YALE & TOWNE MANUFACTURING COMPANY

Department L-37

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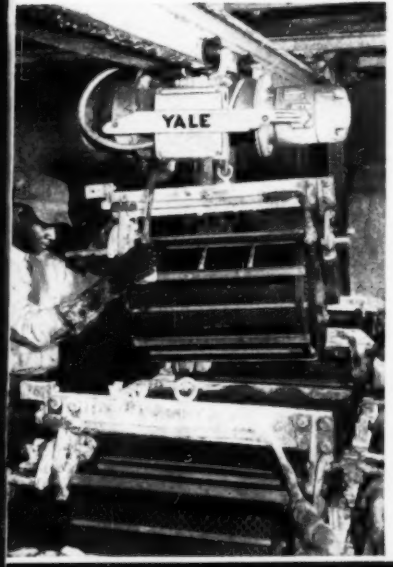

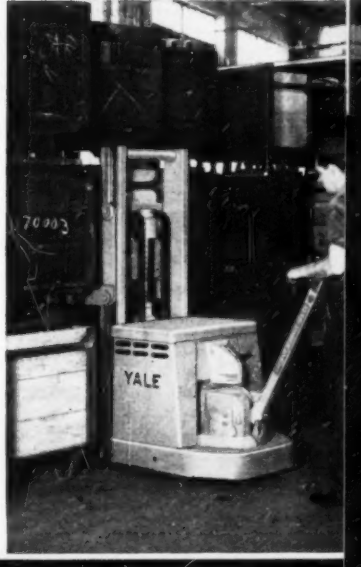

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MATERIAL HANDLING MACHINERY · *hoists . . hand and electric · trucks . . hand lift and power · industrial dial scales*

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Big Shaper Performance
Small Shaper Price

The SHELDON 12" Back-Geared Shaper is neither too big, nor too small. It is just right for most shaper work in most tool rooms and shops.

In weight, design features, capacity and performance, it is a "big shaper." In price, operating cost and floor space, it resembles a "small shaper." It is the logical 1st shaper for the small shop and a cost-cutting tool in multiple installations in large plants.

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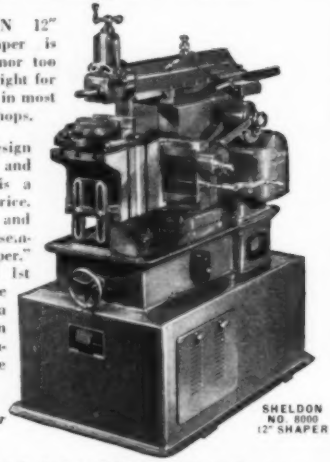

SHELDON NO. 8000 12" SHAPER

SHELDON MACHINE CO. Inc.

Manufacturers of Sheldon Precision Lathes • Milling Machines • Shapers

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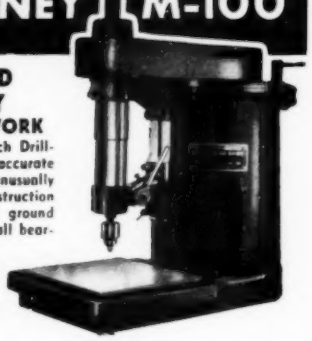
SIGOURNEY M-100



MAINTAINED ACCURACY IN PRECISION WORK

The Sigourney M-100 Bench Drilling Machine is extremely accurate on precision jobs. It is unusually sturdy and rigid in construction . . . has hardened and ground spindles . . . and sealed ball bearings throughout. All moving parts are entirely closed for maximum operator safety. M-100 is built for long and steady service.

This sturdily constructed bench drilling machine is available in 1, 2, 3, and 4 spindle models . . . speeds from 4,000 to 10,000 r.p.m.

Send for Illustrated Bulletin

THE SIGOURNEY TOOL CO.
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PRATT & WHITNEY

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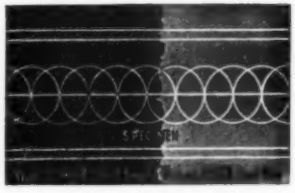
DYKEM STEEL BLUE

STOPS LOSSES
making dies & templates

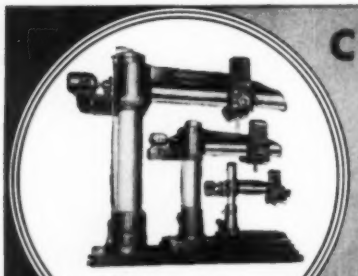


Simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information

THE DYKEM COMPANY, 2301 B North 11 St., St. Louis, Mo.

In Canada: 2400 Dundas St. West, Toronto, Ont.



"Anti-friction Bearings Throughout"

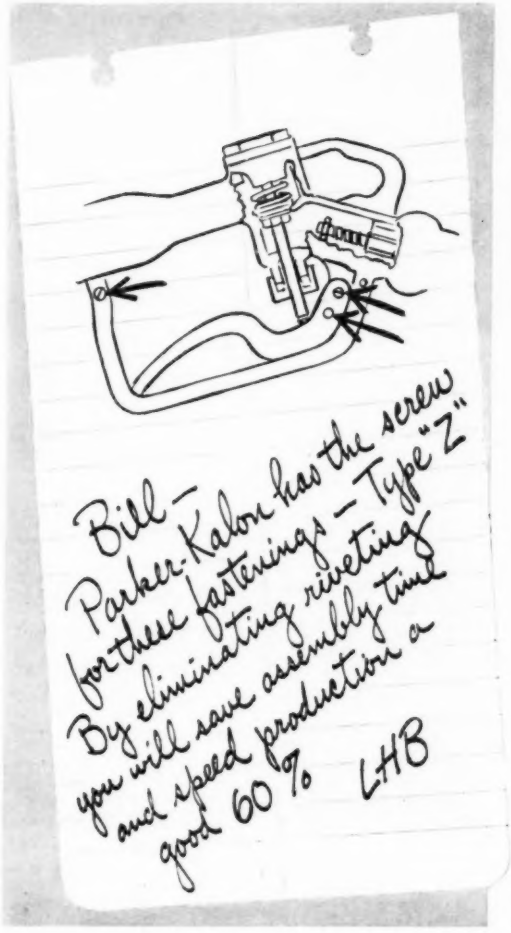
CARLTON RADIAL DRILL

FEATURES: 1. Low Hung Drive to Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all Speeds. 4. Concentrated and Convenient Push-button Controls. 5. Constructed on Unit Principle.

THE CARLTON MACHINE TOOL COMPANY

CINCINNATI 25, OHIO, U. S. A.

TO CUT ASSEMBLY COSTS...
fit the fastener *to the job*



IT CAN BE costly to assume that the presence of metal *assures* a means of good fastening. The screw designed and built for sheet metal .050" to .200" thick is not the most efficient fastener for sheets or plates over .200" thick.

To avoid fastening failure, to prevent assembly stoppage . . . to hold production costs to the minimum, *fit the fastener to the job.*

Parker-Kalon alone offers a complete line of Self-tapping Screws (the most economical fastener) for every metal and plastic assembly. P-K Assembly Engineers thus can recommend, without bias, the type of fastener that best serves the application. That's why . . .

more Fastening-wise Manufacturers call on Parker-Kalon

Look at all these other advantages . . .

MORE Know-How — Parker-Kalon originated the Self-tapping Screw and has been the leader with new designs ever since.

MORE "Show How" — P-K's staff of Assembly Engineers has helped solve nearly a million application problems.

MORE Exacting Quality Control — P-K's investment in laboratory testing and inspecting equipment is unsurpassed.

MORE Production — Parker-Kalon is the world's leading manufacturer of Self-tapping Screws.

MORE Top-Rated Distributors — Everywhere throughout the nation P-K Self-tapping Screws are readily available.

PROMPT DELIVERIES from stock on most types and sizes.

LET A P-K ASSEMBLY ENGINEER HELP YOU simplify your product's assembly and avoid unnecessary production costs by fitting the fastener to the application. Often, he can save you the necessity, and expense, of using special fasteners. If you prefer, mail assembly details for recommendations. Parker-Kalon Corporation, 200 Varick St., New York 14, N. Y.

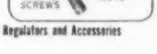
REMEMBER . . . IF IT'S *P-K* . . . IT'S *O.K.!*

P-K *The Original*

PARKER-KALON SELF-TAPPING SCREWS

FOR EVERY METAL AND PLASTIC ASSEMBLY

P-K Also Makes
Cold-forged



OTHER P-K PRODUCTS: Cold Forged Socket Screws, Wing Nuts, Thumb Screws • Hardened Screwnails and Masonry Nails • Shur Grip File and Solder Iron Handles • Metal Punches • Damper Regulators and Accessories

THEORY AND PRACTICE MEET—

In The OLIVER "510" Drill Pointer

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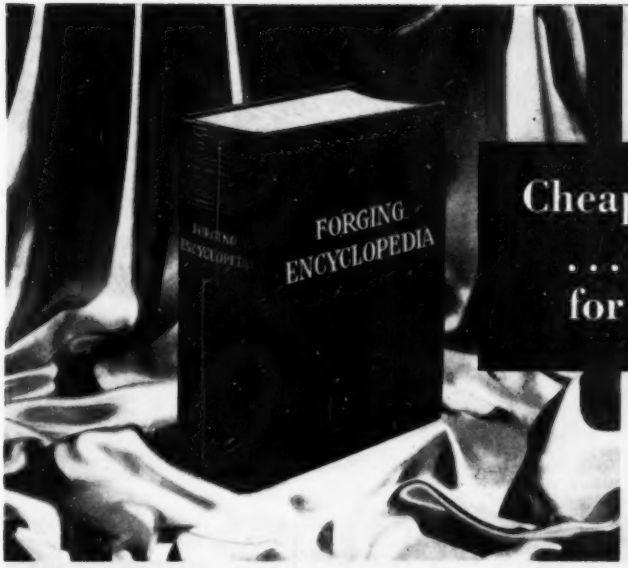

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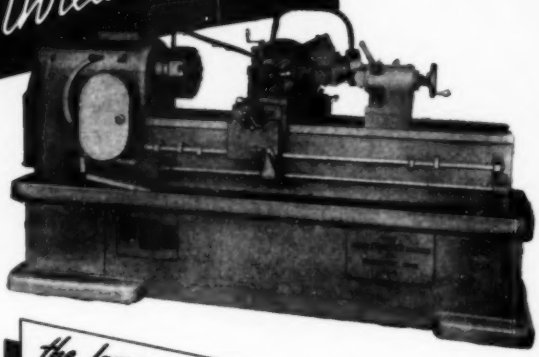

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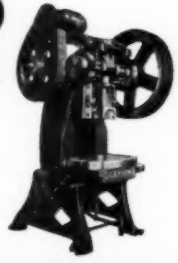

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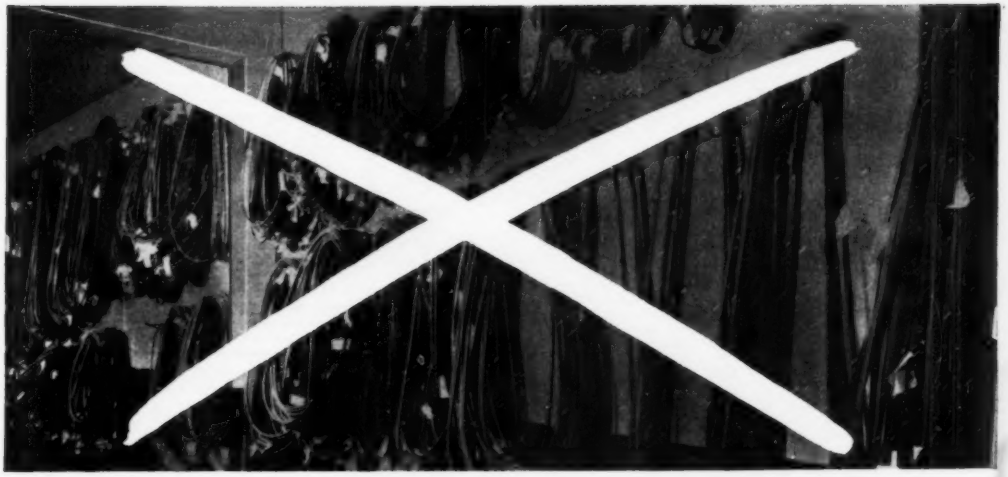

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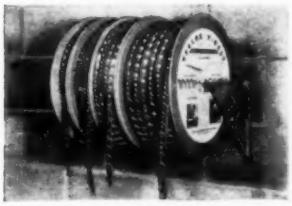

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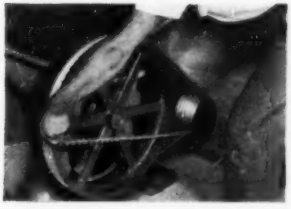

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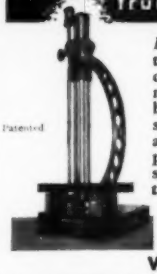

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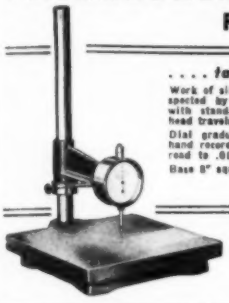

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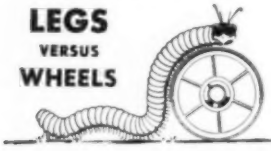

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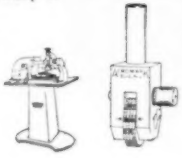

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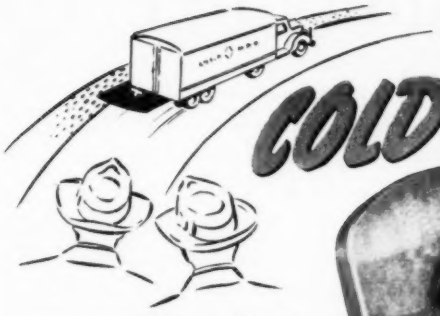

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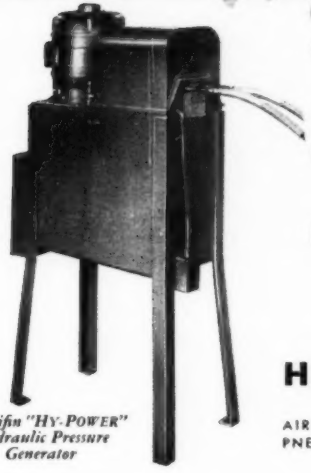

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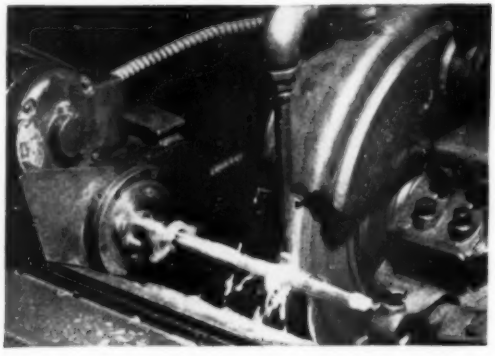

The Monthly Robertson Bulletin

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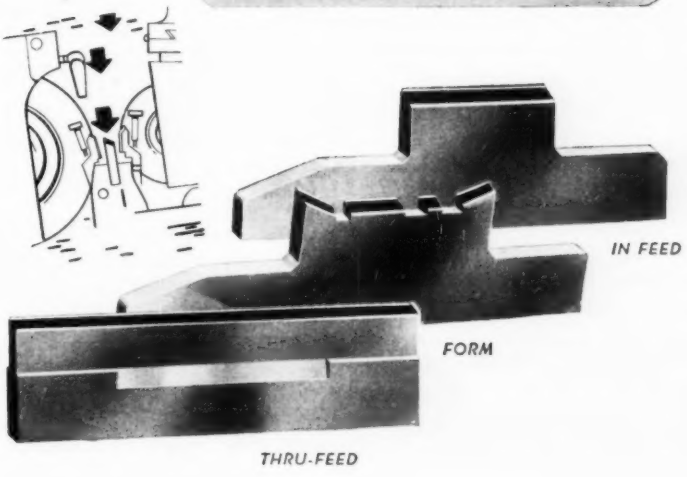

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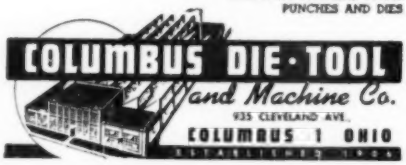

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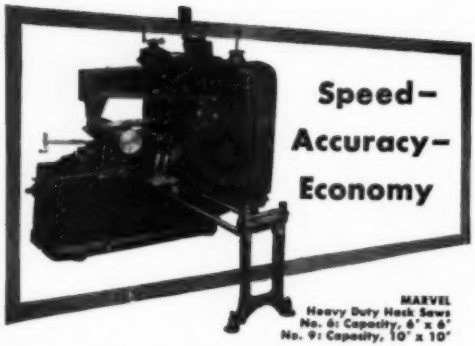

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Designed for high production, smooth performance, Linley Riveting Machines are the answer to economical assembly problems. Spinning principle shapes heads silently . . . with controlled pressure and adjustable spindle stroke. Capacities to ⅜" diameter. Thrust bearing supports spindle, assures long life. Eight models.

The ingenuity and "know-how" that goes into these machines can be put to work on your riveting problems. Call write . . . or come in any time.

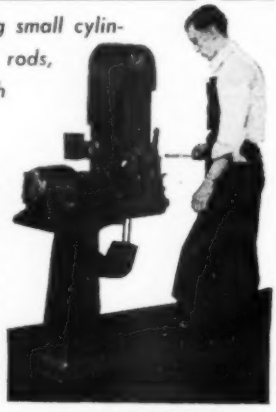
LINLEY BROTHERS CO.
674 STATE ST., EXTENSION
BRIDGEPORT 1, CONNECTICUT

SEND SAMPLES
We will gladly rivet sample parts and return them for your inspection.

2 LN 49

"PRODUCTION" TYPE S
CENTERLESS Surfacer, Polisher, Buffer

Ideal for polishing small cylindrical parts, bars, rods, tubes up to 1½ inch diameter.



Uses abrasive belts for cutting — Felt Belts for polishing and buffing. Excellent results can be obtained on metals, fibre, plastics, wood and many other similar materials—Simple to operate, no centering no chucking, no holding, literally takes the work from operator's hand.

Send us samples of your work for a full laboratory report, the results will interest you — no obligation.

SPECIFICATIONS
Abrasive Belt: 4" wide, 66" long.
Belt Speed: 3200' per min.
Table to Floor (Horizontal position). 36"
Table: 4½"x13½"
Motor: 1½ H.P. 1750 R.P.M.

Production
MACHINE COMPANY GREENFIELD, MASSACHUSETTS, U.S.A.

GUARANTEED WATERPROOF FOR WET OR DRY GRINDING
MAXIMUM HOLDING POWER
LONG LIFE CONSTRUCTION
FOR OPERATION ON 110 OR 220-VOLT D.C.

L-W MAGNETIC CHUCKS

5½" x 13" $47.65
6½" x 18" $63.10
8" x 24" $109.30
10½" x 37" $202.05

DEMAGNETIZERS

A single pass over the stationary poles is sufficient to completely demagnetize work that has become magnetized through induction. Model B-2 for large work, complete with pilot light signal, switch and cord. Operates on 110 volts A.C. current. 7½" wide, 12½" long, 6½" high. Shipping weight 55 lbs. $63.20

Model J-1 for small work, complete with switch and cord. 7½" wide, 7½" long, 6½" high. Shipping weight 35 lbs. $41.15

RECTIFIERS

For converting A.C. into D.C. for use on magnetic chucks. A.C. input 110 volts. D.C. output 110 volts. For continuous duty and long life. P-1 for 5½"x13" chuck 0.8 amps. $38.75
P-2 for 6½" x 18" chuck 1.0 amps., $45.00. P-3 for 8" x 24", 10½" x 37" chuck 3.0 amps., $60.00.

DEMAGNETIZING SWITCHES

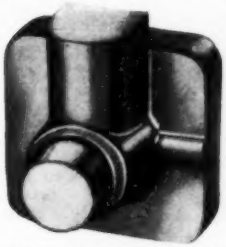
For use on our 5½" x 13" and 6½" x 18" sizes. When the switch is thrown to "ON" position, the chuck is magnetized, and the work held firmly for grinding. When the work is to be released, the switch is thrown to "DEMAG" and contacts are touched momentarily to neutralize the chuck. $8.90
Field discharge type for 8" x 24" and 10½" x 37" $16.25

Send for complete catalog giving prices and specifications on these quality low-cost L-W Products

L-W CHUCK COMPANY 2550 ST. CLAIR ST. TOLEDO 3, OHIO

BRASS FORGINGS

are the answer where non-corroding, non-porous materials of great strength are essential



BRASS FORGINGS ARE SUPERIOR IN MANY WAYS TO SAND CASTINGS

LOWER COST: The combination of smoother surfaces, absence of porosity, better machinability, longer tool life, less chucking difficulty, closer tolerances, fewer operations, lighter weight, and practically no scrap, results in the production of a superior product at a lower cost.

Forgings possess about twice the tensile strength of sand castings. Extreme pressures under which the forgings are produced, once during extrusion and again during forging, assures a dense, close-grained material.

Due to the absence of scale, sand, etc. in the metal, forgings can be machined at a higher rate of speed than similar parts made by other processes, and the smoothness of surface, combined with close tolerances, frequently eliminates machining operations. The life of machine tools is greatly increased.

COMPARISON OF COST OF AVERAGE BRASS FORGINGS AND BRASS CASTINGS

(Quoted Figures are approximate)

Machined — Ready to polish, buff and plate..... FORGINGS COST 20% LESS

Polish and Buff..... FORGINGS COST 50% LESS

Scrap after Polishing and Buffing.....	CASTINGS	FORGINGS
	7%	0

The Mueller Brass Co. is equipped to forge, completely machine, polish, buff, lacquer or plate. Let us quote you on your product in Forged Brass.

MUELLER BRASS CO.

PORT HURON, MICHIGAN

RIDERMIKROKATOR
..for OUTSIDE MEASUREMENTS

The Ridermikrokator is intended for checking out-of-roundness and diameters of cylindrical parts. As the measurements are carried out according to the three point principle the instrument can be used to good advantage for checking centerless-ground pieces.

They are provided with hardened ground and lapped anvils and insulating grips. The measuring surfaces of the anvils can be tipped with cemented carbide. Price on application.

This instrument is supplied with removable measuring points with ranges from 3/16" to 4¾".

Prices and Literature Upon Application

Setting ridermikrokator by means of a master.

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ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.
Manufactured By
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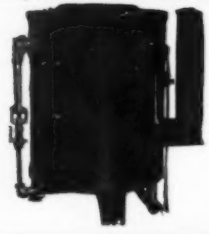
BUZZER *Gas Fired* **POT FURNACES**



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Atmospheric Pot Hardening Furnace, tangentially fired, assures quick, even heat. Many models available — write for "BUZZER" catalog showing Gas Furnaces, Burners, and other equipment.

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PART NUMBERS . .
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Marking Tools.

Send prints of parts showing desired marking and its location for free recommendation.

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Severance CARBIDE MIDGET MILLS
Operate at grinding-wheel speeds
Outlast scores of mounted points
Cut 50 times faster
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Cut hard materials - Rockwell 65-C
¾ SIZE
Write for Catalog No. 16
May be REGROUND time-after-time by Severance—savings are thus multiplied
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AUTOMATIC EQUIPMENT
The VEO Press Company
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STRAIGHT SIDE SINGLE CRANK PRESSES
for heavy blanking and forming

Heavier classes of blanking and forming work can be handled efficiently and economically on these presses.

Sturdily constructed with either solid frame or built up with tie rods. Small elastic deflections do not affect tool alignment. All stresses taken centrally. Made also with wedge adjustment for slide for very close work.

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RAMS—Symmetrical, giving equal distribution of weight and balance. Lock screws concealed in the ball nut eliminate necessity of refitting when adjustments are made to take up wear. **GIBS and V-WAYS**—For increased accuracy, speed, and to lessen possibility of "wobble", gibs and V-Ways are one-third longer than usual. No sacrifice in shut height. Surfaces carefully hand scraped. **CRANKSHAFTS**—Generously oversize, forged from high carbon steel, turned and ground to exacting specifications. "Plus-factor" of strength guarantees efficiency during life of press. **BRAKE and BEARINGS**—Spring tension type, allowing for heat expansion. Fitted with special linings. Main crankshaft bearings are honed to exact size. Bearing caps are split vertically and rest on reinforced frame. Shock from thrust and return stroke is transmitted directly to frame.

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KNOCKOUT BRACKET—Hazard of misalignment due to knockout bar impact overcome—anchored to frame. Great saving in adjustment time.

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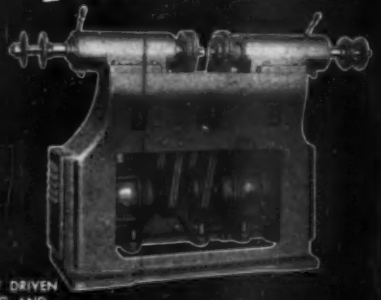
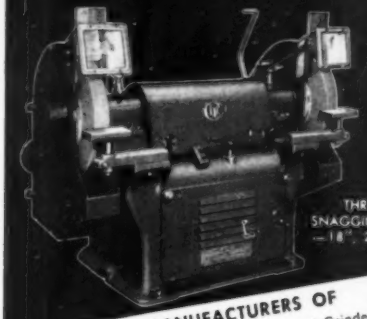


VEE BELT DRIVEN BUFFING AND POLISHING LATHES 3, 5, 7½, 10 AND 15 H.P. —SINGLE OR DOUBLE MOTOR

WET ABRASIVE CUT-OFF MACHINE. CAPACITY: 2¼" SOLIDS— 3⅛" TUBING



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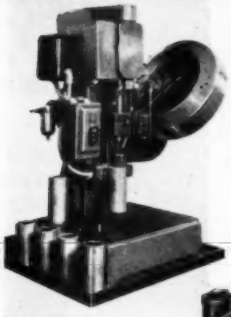
Yes! WE DO MAKE Special ASSEMBLING MACHINES



Motorized Hopper Units by the Detroit Power Screwdriver Company are "tailor-made" for special assembling applications . . . They eliminate the manual handling of parts . . . Let us solve your production assembling problem . . . Contact us now; send special assembly and component parts for quotation.

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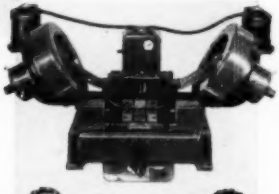
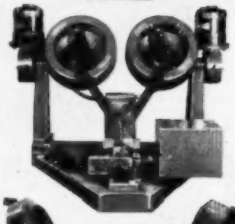
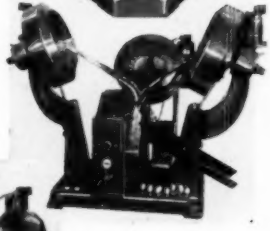
Pressing terminal studs in dry cell batteries.



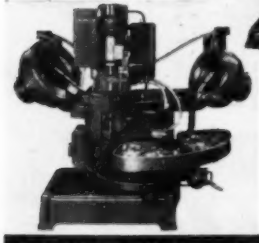
Assembling small hardware hinges by inserting two hinge pins simultaneously.



Inserting mounting screws in cooking utensil handles.



Automatic assembly of toy plastic wheels and axles.

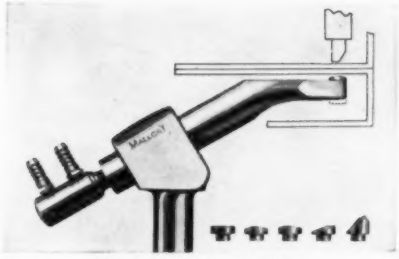


Assembling screw and fibre washer to cable clamp for electrical outlet box for shipping purposes.

DETROIT POWER SCREWDRIVER CO.

2797 W. FORT ST. • DETROIT 16, MICH.

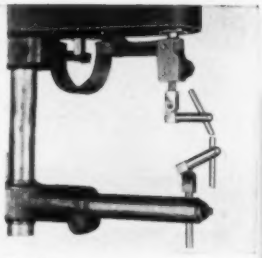
There's No Holding
MALLORY
For Resistance Welding Electrode
HOLDERS



The Paddle Type Holder

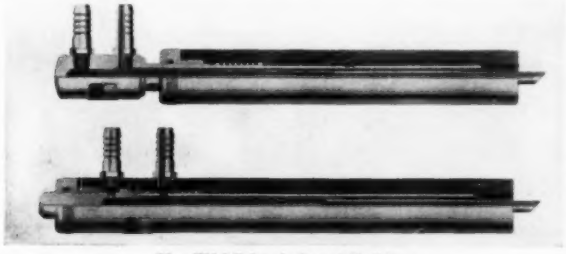
Here's a new design specially created to get at confined, inner recesses. It permits a variety of positions to speed up operations in inaccessible places. Standard button-type tips of various designs can be used on top or bottom of the holder.

Those who know resistance welding know they can depend on Mallory for holders specially designed and proved to do better jobs. Put these new proved designs to work for you without delay. Write for additional information.



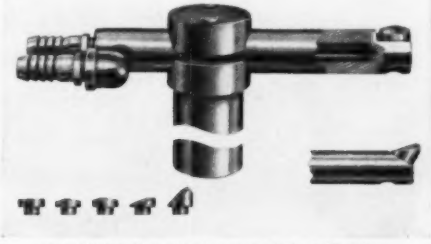
The Bench Type Holder

Here's another big "first" from Mallory—the only holder for bench type resistance welding that offers complete versatility in adjustment using standard packaged electrodes. Has 180° range of head adjustment, positive locking under full operating pressures. Eliminates need for special hand-made tips.



The "KO" Leak-Proof Holders

Another piece of welding history written by Mallory is this line of leak-proof holders. Uses standard size O-Rings in place of ordinary packing. Complete assembly, including internal parts, made of copper alloy, brass or stainless steel. Prevents rust or corrosion that could interfere with water flow or easy ejector action.



The Light-Duty Universal Offset Holder

Here's the light duty holder that is Mallory's solution to getting at those hard-to-reach spot welds. Incorporates standard button-type tips of various designs. Efficient water cooling insures maximum tip life under severe conditions.

A complete research laboratory and engineering department equip Mallory to serve you best. See Mallory first—*and get the* best!

Resistance Welding Tips, Holders, Dies, Rod and Bars, Castings, Forgings

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COOLANT PUMPS

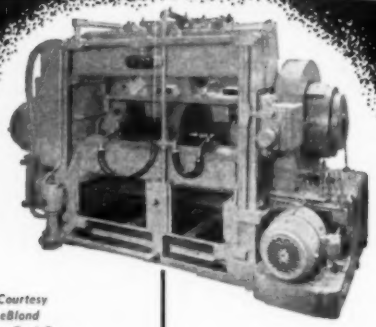

Photo Courtesy R. K. LeBlond Machine Tool Co.

Illustrated is a LeBlond 4 Station Indexing Drum Machine for Turning Automotive Crankshafts, equipped with a ½ H.P. Model 71023-B Long Ruthman Gusher Pump.

Expertly designed and precision built of the best materials, Ruthman Gusher Coolant Pumps give you top performance on your coolant systems. Their wide acceptance as the leaders in the coolant pump field is your best assurance that Ruthman Gusher Coolant pumps are the best you can buy. *If you want more for your money, specify Ruthman Gusher Coolant pumps on your machines today.*

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1818 READING ROAD CINCINNATI, OHIO

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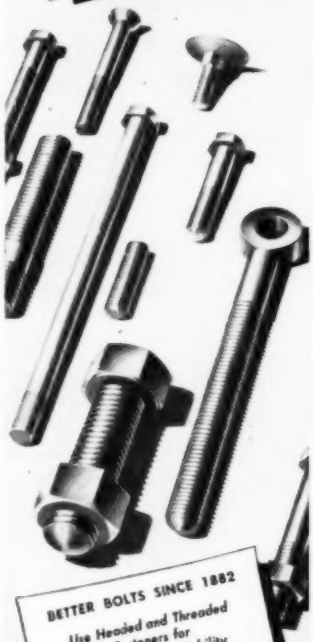
Stainless • Monel
Alloy Steels
BOLTS NUTS STUDS

Here's a full line of bolts, nuts and studs in all types of metals. Accurately threaded to assure a uniform Class 3 Fit, Pawtucket products are made in standard dimensions or to your specifications.



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Use Headed and Threaded Fasteners for Economy and Reliability

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. . . MEET EXACTING TOLERANCES

with the

CINCINNATI-GILBERT

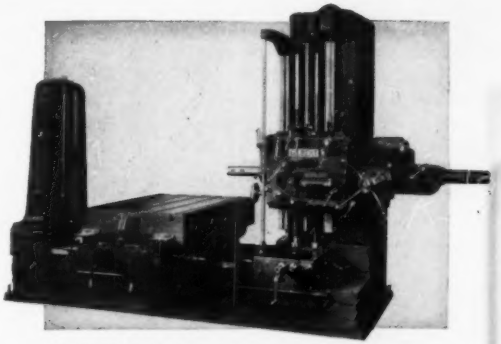
Horizontal Boring, Drilling & Milling Machines

In addition to the need for high production machines as an aid in lowering costs, there are many jobs where exceptionally close tolerances are a must, and require precision machine tools.

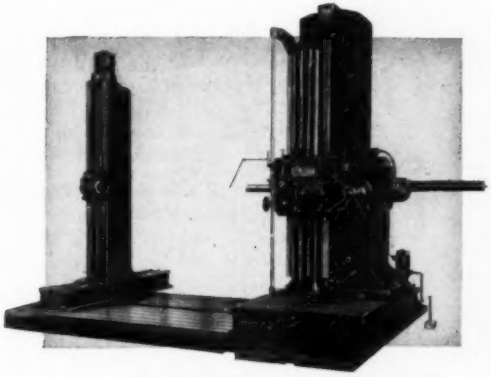
On precision boring, milling and drilling operations, the Cincinnati-Gilbert Horizontal Boring Machine offers many sound principles of design which assure dependable accuracy over long periods and maximum productive capacity.

The machines are available in table and floor types. The table type is furnished with compound rectangular and compound built-in rotary types. Floor models are furnished with Bed Plate and Boring Bar Support and with various table arrangements in place of the bed plate—either stationary or adjustable tables.

For complete details write for bulletins covering both types.



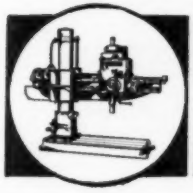
COMPOUND RECTANGULAR TABLE TYPE—Tables 38" x 60" to 48" x 84". Head Travel 36" to 72", Bed 8.4" to 120". Bulletin No. 1040-R.



FLOOR TYPE—Head Travel 36" to 96" Column Travel 36" to 144". Can be equipped with Floor Plates, Boring Bar Supports, Stationary, Sliding or Built-in Rotary Tables, Revolving Columns and Special Arrangements. Bulletin No. 1244.

Features of Cincinnati-Gilbert Single Spindle Horizontal Boring, Drilling and Milling Machines.

1. Hardened High Speed Single Spindle 1420 RPM.
2. Full Ball Bearing Equipped including Precision Preloaded Bearings for Spindle.
3. Hardened Ways on Bed (Table Type) and on Runway (Floor Type).
4. Pressure or Splash Lubrication to all Units.
5. Hardened and Shaved Alloy Steel Gears and Ground Multiple Spline Shafts.
6. Centralized simple control for all movements.
7. Narrow guides with screws located within the guide for all sliding units.
8. Built-in motor on head—no long shafts or bevel gears.
9. Can be equipped with built-in Precision Thread Chasing Unit for Spindle.



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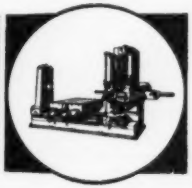

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- **speed production**
- **lower marking costs**

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By A. Albert Klaf, *Civil Engineer, Board of Water Supply, NYC*

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— At what peripheral speed is the power output of an impulse turbine a maximum if it is driven by a jet of water or steam flowing at 30 feet per second?

— How do you arrive at the relation between the pressure developed by a centrifugal fan and the fan speed?

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THE CASE OF THE UNIDENTIFIED ALLOY

. . . of rising importance to Metalworking as its use of alloys continues to expand . . . is well on the way to successful solution.

"Rapid Tests for Identifying Alloy Steels," a Special Report from the February 24 AMERICAN MACHINIST, a sure, rapid, economical method for identifying valuable alloy steels which have lost their identifying markings is explained by Elbert C. Kirkham, one of the country's outstanding authorities on spot testing of metals.

Seventy-first of our Special Reports since war's end, "Rapid Tests for Identifying Alloy Steels" is another graphic example of how AMERICAN MACHINIST brings metalworking production management a steady flow of authoritative help in promoting a better, more economical use of every important material of manufacture. Whether it be ferrous or non-ferrous metals or plastics Metalworking turns *first* to AMERICAN MACHINIST for the information it needs and seeks.

Reprints of this helpful article are available at 20 cents each, or 18 cents each in quantities of 100 or more.

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American Machinist

The McGraw-Hill Magazine of Metalworking Production

McGraw-Hill Building, New York 18

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AO Nose Shield for F3100 Goggle

AO PRESENTS A NEW

NOSE SHIELD

FOR THE F3100 GOGGLE

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"WISE ECONOMY RESULTS FROM WISE SELECTION OF CUTTING FLUIDS"

THE case studies listed below of benefits derived from the soundly engineered application of D. A. Stuart cutting fluids will unquestionably appeal to cost-conscious management and production men. These reports are typical of those received daily.

An Eastern firm operates a special threading machine for simultaneously threading three BX connectors drawn from SAE 1010 sheet. Running at 68 S.F.M., finish was unsatisfactory. A change to D. A. Stuart THREDKUT produced a satisfactory finish and increased production. In addition, die life was increased 3 to 4 hours.

A rifle manufacturer crush dress grinding 8640 roll hardened (Rockwell C40) bolts was obtaining 15-20 pieces between dressings and crushing roll performance was poor. Selection of D. A. Stuart SUPERKOOL 81-X gave them over 300 pieces from one wheel dressing.

It is significant that in both of the above cases, selection of a cutting fluid was made on a basis of *performance*, rather than price or opinion.

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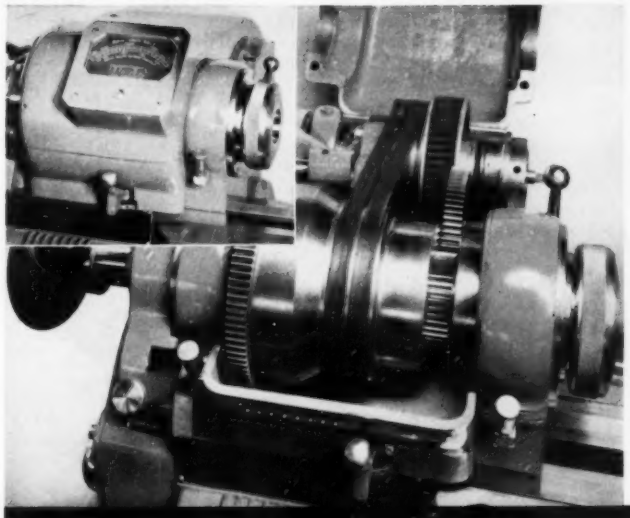

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Speeds from 32 to 2000 R.P.M.

This is the only lathe of this size and type, offering such a range of *stepless* spindle speeds!

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THIS DRIVE IS FOOLPROOF! It is entirely mechanical . . . cannot be damaged by changing spindle speeds either while the lathe is running or stopped. Reason for this is the unique clutch arrangement that makes it possible to *start, stop,* and *brake* the spindle with the motor running! This is a distinct advantage over most lathes, which rely on the motor and a brake to start and stop the spindle. **Write today for circular describing the Wade No. 8A**

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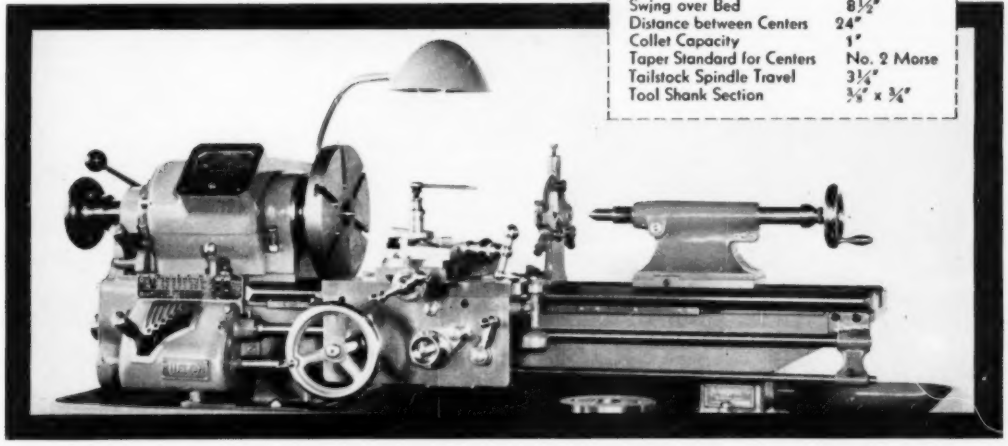
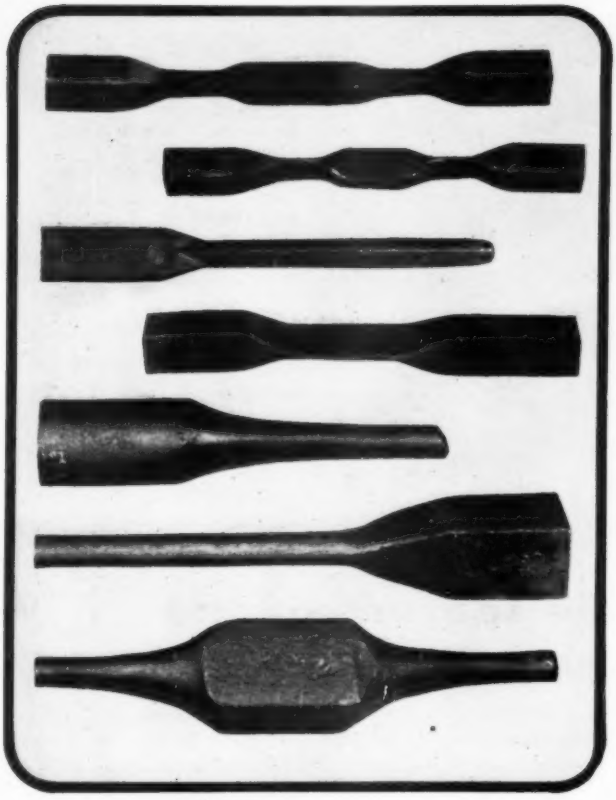
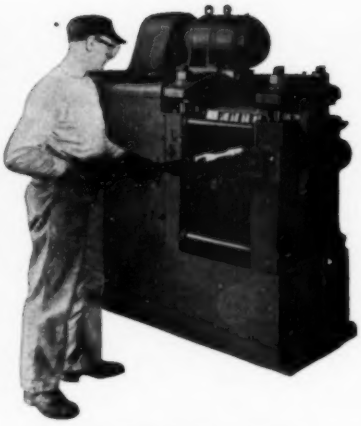
SPECIFICATIONS

Swing over Bed	8½"
Distance between Centers	24"
Collet Capacity	1"
Taper Standard for Centers	No. 2 Morse
Tailstock Spindle Travel	3¼"
Tool Shank Section	⅜" x ¾"







AJAX ROLLS

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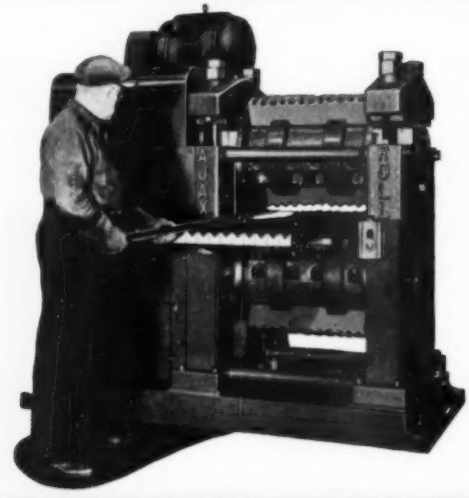

Available in six sizes, AJAX Wide Adjustment Forging Rolls have capacities for pre-rolling forging blanks ranging from the smallest automobile valve rocker arm to the largest airplane propeller. And backing these, AJAX engineers have a priceless wealth of experience in design of roll grooves and pre-rolled forging blanks acquired during the more than fifty years since AJAX introduced these Rolls into the forge shop.

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And Additional Information

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TOOL ENGINEERS HANDBOOK

AMERICAN SOCIETY OF TOOL ENGINEERS
FRANK W. WILSON, Editor-in-Chief

THIS massive reference covers all mechanical processes employed in engineering raw materials into finished products in the most efficient, economical way. In it you'll find the information you want on machinery, machine tools, gages, dies, fixtures and special tools. Consult it for rules, formulas, procedures and data influencing the economic manufacture of products called for by the product design engineer. Use it with complete confidence; data included here are based, where possible and practicable, on standards established by the government; the professional associations and leading industrial companies.

Partial Listing of the Handbook's 115 Big Sections which cover tool engineering from A to Z.

- Tool Engineering Economics
- Job Planning and Control
- Small Tools Planning and Control
- Plant Layout
- General Structure and Properties of Metals
- Properties and Workability of Plastics
- Plastics Forming
- Investment Casting
- Powder Metallurgy
- Milling
- Broaching
- Engine Lathes
- Horizontal Turret Lathes
- Drilling, Reaming and Counterboring
- Gear Shaping
- Thread Chasing
- Pressworking of Metal
- Oxygen (Flame) Cutting
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- Punches and Dies
- Mechanics, Physics and Mathematics

More than 2000 pages—over 1500 illustrations—hundreds of tables, charts, keyed diagrams, symbols, definitions, equations, etc.

Here is a small selection of highlights selected at random to illustrate the type and scope of the information in this Handbook.

—Includes all new techniques and processes of recognized acceptance: e.g., Powder Metallurgy, Investment Casting, Non-destructive Testing, Plastic Joining of Materials, etc.

—Conventional tables of feeds, speeds and cuts modernized to bring them into line with latest cutting-tool materials and cutting practices.

—Takes up the cleaning of metal surfaces, all types of electroplating, heat and chemical applied coatings, etc.

—Treats, *process-wise*, such topics as Plaster Mold Casting; Die Hobbing; Superfinishing; Rotary Swaging; Sheet and Strip Cold Roll Forming.

—Provides detailed symbols, definitions, equations for motion, linkwork, statics, dynamics and friction in mechanics.

—Covers principles of induction heating; design and application of coils; tubing type vs. solid; single-turn, multi-turn, conveyor types, etc.

—Describes types of machines, cutting tools, toolholders, fixtures and operations in precision production boring.

—Covers every phase of metal cutting and machinability; everything from the geometry of chip formation to the relation of tool forces and power consumption to machining variables.

—Discusses welding, gluing, and mechanical joining of materials.

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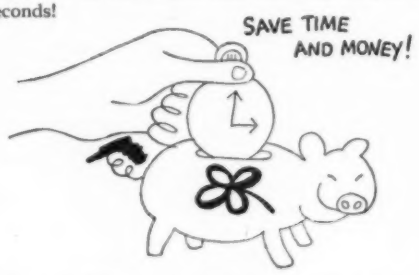

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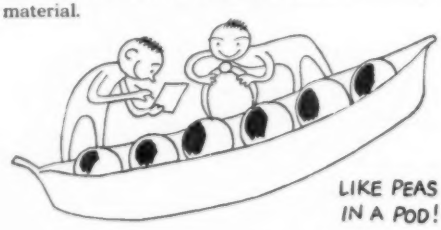

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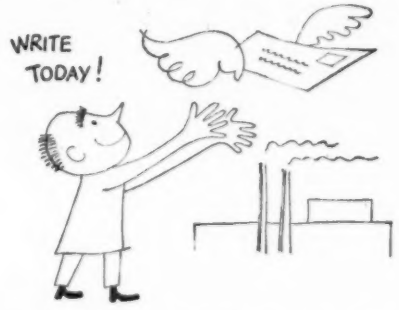

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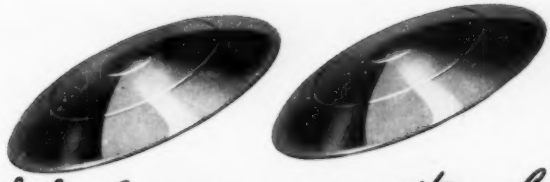

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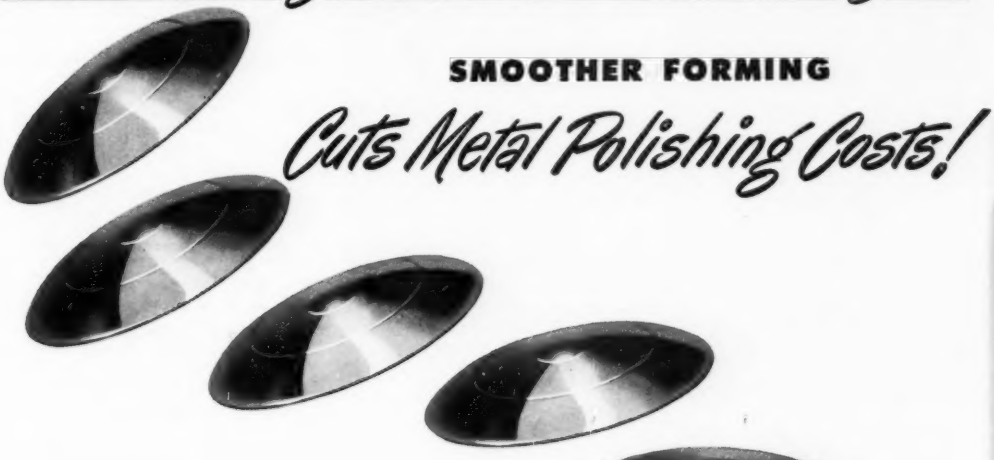

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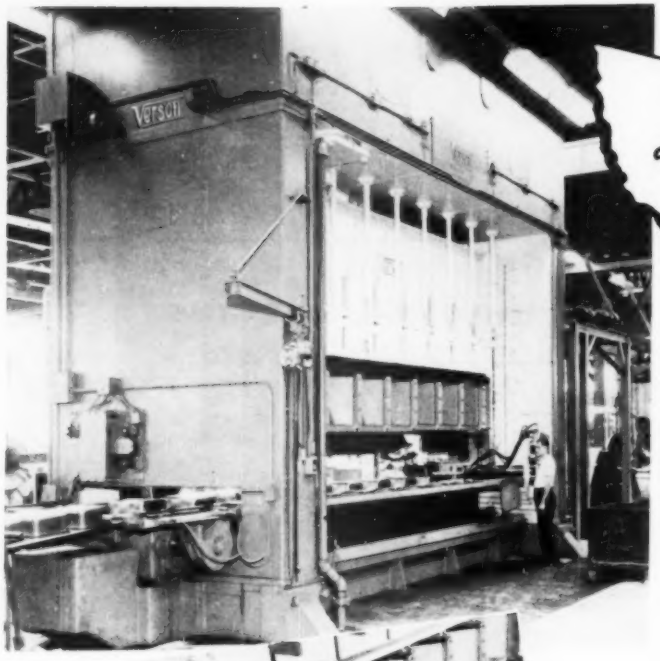

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18x48" Cincinnati Hydraulic, m.d., latest

DISC GRINDERS

No. 4 Gardner Disc, m.d.
No. 20 Gardner Comb. Disc Grinder & Roll Sander, m.d.
7½ HP. Standard, m.d., new
7½ HP. U.S. Elec. Tool Co Disc Grinder, md., new

INTERNAL GRINDERS

No. 16A—16" Bryant, m.d., latest
No 16—22" Bryant, m.d., latest
No. 16RS Bryant, m.d. latest
No 16—36" Bryant, m.d., latest
No. 6, 9, 10, 20 Bryant, belt
No. 24—21" Bryant, m.d., late
No. 24—36 Bryant, m.d., latest
No 49 Heald Single End Borematic, m.d.
No. 70 Heald, belt
No. 72A Heald Plain, m.d.
No. 72A3 Heald Sizematic, m.d.
No 72A3 Heald Gagematic, md.
No. 72A5 Heald Sizematic, m.d.
No. 72A5 Heald Plain, m.d.
No. 72A5 Heald Plain, long bed type, m.d., latest
No. 73 Heald Airplane Cylinder, m.d., brand new, latest
No. 74 Heald, m.d.
No. 174 Heald Gap, m.d., latest
No. 649-16 Van Norman Automatic Oscillating Radius, m.d., latest
Series 5, No. 5 Bryant, m.d., latest

SURFACE GRINDERS

No. 3 Abrasive, m.d.
No. 7B Van Norman Automatic Piston Turning and Grinding Machine, m.d.
Arter Model A-1-8" Rotary, m.d.
No. 11 Blanchard Rotary, m.d., latest
No. 16 Blanchard Rotary, m.d., 26" chuck
12x16x60" Thompson Hydraulic, m.d., late
No. 22—12" Heald Rotary, m.d., latest
No. 22—12" Heald Rotary, m.d.
No. 25A—18" Heald Rotary, md., latest
No. 25A—24" Heald Rotary, m.d., latest
No. 33 Abrasive Vertical, m.d.
No. 200—16" Heald Rotary, belt
10x12x60" Norton Hydraulic Surface, m.d., latest
14" Pratt & Whitney Vertical, m.d.
22" Pratt & Whitney Vertical, m.d.
54" Bridgeport Knife, belt

THREAD GRINDERS

No. 33 Excello Precision, m.d., latest
No. 39A Excello Internal Thread, m.d., latest

TOOL & CUTTER GRINDERS

No. 2 Cincinnati Universal, m.d., latest
No. 2 Norton Universal Hydraulic, m.d., latest
No. 13 Brown & Sharpe, md., latest
Cincinnati Monoset, m.d.
Sterling Tool & Cutter, m.d.
Gleason Cutter, m.d.
No. 2B Sellers Drill, m.d.
No. 12M Grand Rapids Tap, m.d.
No. 4T Sellers Tool, m.d. latest
No. 51 Oliver Drill Pointer, m.d.

MANUFACTURING LATHES

No. 4 LeBlond Boring Lathe, 37" bed, 13" hole
No. 9, 12, LeBlond Multi-Cut, m.d.
3½x36", 3½x80" 4x60", 8x84" LeSwing, m.d.
8x132" LeSwing, m.d., latest
9x12" Sundstrand, s.p.d.
11x18" LeBlond Rapid Production, m.d.
12x18" centers Monarch Model 5T, m.d.
13"x24" LeBlond Rapid Production, Timken, latest
13"x24" Coulter Automatic Threading, m.d.
13x36" LeBlond Rapid Production, Timken, latest
13x48" Coulter Automatic Threading, m.d.

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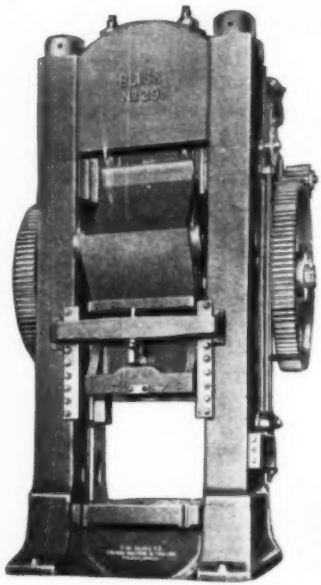
KNUCKLE JOINTED COINING PRESSES



TOLEDO - - - 667 - - - 668

Pneumatic Operated Friction Clutch

CAPACITY . . .	1200 TONS	. . .	1500 TONS
STROKE	5 "	. . .	6 "
DIE SPACE . . .	33½ "	. . .	36½ "

DOUBLE BACK GEARED

Equipped with Two Station Air Operated Dial Feed — Bottom Lift Out — And Air Operated Pickoff

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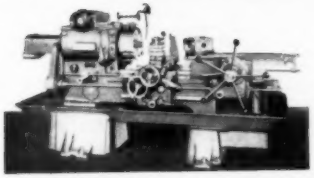


Gisholt #4 Universal Grd. Head Ram Type Bar Feed Turret Lathe. 2" Capacity. 12 speed hd. Hydraulic Speed Selector. Has tooling & coolant system.

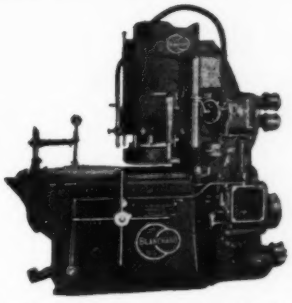
TURRET LATHES

Bardons & Oliver #1 Electric Turret Lathe. ¾" cap. Has bar feed & collets.
Morey #2 Geared Head 1" Cap., M. Dr.
Simmons Microspeed 1" Cap., M. Dr.
Oster #601 Hand Screw, Machine 1½" cap.
W-Swasey #4 Univ. 1½" cap., M. Dr.
Jones & Lamson #3 Univ. Bar Feed 1½"
W-Swasey #3 Univ. 1½" cap., M. Dr.
Bardons & Oliver #7, Univ. 2½" Cap.
W-Swasey #3A Univ. 3½" cap., M. Dr.
Warner Swasey #1A Universal Heavy Duty Saddle Type Turret Lathe. Serial #648220. Capacity—2½" rd., Grd. Hd. 12 speeds. Coolant syrtem, bar feed, chuck & tooling. Immediate delivery Excellent condition. Hydraulic Speed Selector.

Dreis & Krump #458D Motor Driven Power Press Brake. Serial #5439. 7½ h.p. 3/60/220/440 volts motor. Also ram motor. Push button controls. Capacity—8'x¼" steel and lighter. Takes 8'6" between housings. Throat—8". Stroke—3". Die Space—12". 30 strokes per minute. Has Standard Die Holders, also Adjustable gauges.

ENGINE LATHES

LeBlond 36"x30' Q.C.G. Hvy. Duty Geared Head Screw Cutting Engine Lathe. Serial #NK-230. 12 Speed Head. 36" internal grd. faceplate, Taper Attachment, Dial Thrdg, Set of toolholders. Max Swing—39". Centers—22'6". 25 h.p. 3/60/220/440 volts V-belt drive.
24"x16' American Q.C.G. Motorized Cone Head. 11' centers. Taper Attachment. 24" chuck, faceplates, cabinet type legs. 220/440 volts motor & controls.
24"x12' Putnam Motorized. On raising blocks to swing 32" with 66" c.c.
20"x11' Schumacher-Bove, Q.C.G.
20"x10' American, Q.C.G. 72" centers.
20"x10' Hendey Motorized.
20"x8' Lodge & Shipley, Q.C.G. M. Dr.
18"x8' Davis Q.C.G. 42" centers, equipment.
18"x8' Lodge & Shipley, geared head.
18"x8' Hendey Q.C.G. 49" centers.
18"x6' American, Geared Head, M.D.
16"x8' Hendey Q.C.G. M. Dr.
16"x6' Lodge & Shipley Geared Head.
16"x6' Lodge & Shipley "Patent Head," Motor Dr.
16"x6' South Bend Enclosed Head, Motor driven. Taper Attachment, Chucks, Collets & Quick Acting Collet Chuck.
14½"x6' South Bend Enclosed Head, Motor Driven. Taper Attachment, Chucks, Turret Toolpost Threading Dial, Ram Type Turret Attachment, Collets & Collet Chuck.
14"x8' Reed-Prentice Eight Speed Selective Geared Head, Q.C.G. Motor driven w/220/440 volts motor & controls. Has Taper Att. chuck, faceplates, steady rest, cabinet legs, max. centers —48". Completely rebuilt. Immediate shipment.
BETTS 100" Special Vertical Boring and Turning Mill. 1944 Machine. 2 Plain Heads. Complete electrical equipment. Excellent condition. Immediate delivery.



Blanchard #16 Motor Driven Vertical Rotary Surface Grinder. 26" Chuck with power down feed to head. Built-in coolant system.

GRINDING MACHINES

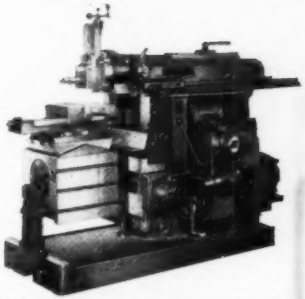
Cincinnati 10"x36" Plain Hydraulic Cylindrical Model #EA. Serial #5P2D1L-19. Filmatic Bearings. Built-in Electrics. Hydraulic Infeed.
Heald #22 & #25, 12" & 16" Horizontal Rotary Surface Grinders. Motor driven.
Cincinnati 'Monoset' Model #OE Cutter & Tool Grinder. Motor driven. With motors & controls. Set of collets, taper & cylindrical and equipment.
Thompson 6x18 Hydraulic Horiz. Surface. Wet & dry work. 220/440 motor driven. Auto, downfeed to head. Motor driven exhauster unit.
Gallmeyer & Livingston #4 Motor Driven Universal Tool & Cutter Grinder. W/Internal Attach. & Thrd. Chaser & Equipment. Motor driven coolant.
Norton 6x18 Vertical Rotary Automatic Surface Grinders. 220/440 volts motors. Excello Spindles, Hydraulic Table feeds. Three Available with immediate delivery. Also 6x18 Horizontal.

AUTOMATICS

#OG & #00 Brown & Sharpe Automatic.
#2G Brown & Sharpe Standard Speed. 220/440 volts motor & push button controls. Complete coolant, turret tooling, collet & collet chuck, toolblocks. FOUR AVAILABLE—FROM STOCK.
#2 Brown & Sharpe Automatic Turner drive 220/440 volts motor. With Stock stands, collet, toolposts, coolant system, change gears. FOUR AVAILABLE.
Cleveland Model "A" 3¼" capacity Single Spindle Motor Driven Automatic. Has lot of tooling, collets, motors and switches & coolant system. 1943.

PUNCH PRESSES

O.B.I. Johnson (NEW) all sizes, geared & plain.
O.B.I. Federal #3, 26 tons cap. motor dr.
O.B.I. Toledo #5, 44 tons cap. motor dr.
O.B.I. Bliss #18, 19C, 20, 20B, 21 motorized.
O.B.I. Michigan, 36 tons cap. Wide ram & bed.
Geared S.S.S.A. Bliss #305 Motor driven.
Wheel Press, Niles, B & Pond Horiz. Hydraulic. 200 tons cap. 48" between strain bars.
Stamping, Ferracute #86 Wide Frame, 61½" between housings. 13¾" stroke. Motor driven.
Transfer, Nilson 56 tons S.S. Dble. Crank 3-Die.
BLISS—Consolidated #77 Open Back Gap Frame Back Geared, 150 Tons Cap. M.D.



GEMCO 20" Standard Duty Universal Motor Driven Shaper. (NEW) Power Rapid Traverse horizontal & vertical. 8 Cutting Speeds, 18 cross feeds. 5 h.p. 3/60/220/440 volts V-belt drive. With 12" Vise & set of wrenches. Immediate delivery.

SHAPERS

Shaper—Columbia 32" B.G. Crank motorized Power downfeed to head.
Shaper—Logan 7" Horizontal. NEW.
Shaper—Machinery Sales 16", motorized.
Shaper—Smith & Mills 16" motorized.
Shaper—Smith & Mills 16" Universal.
Shaper—Gould & Eberhardt 16", motorized.
Shaper—Gould & Eberhardt 18" B.G. Crank.
Shaper—American 24" crank, motorized.

MILLING MACHINES

Nichols Hand, Late Type, M.D. (six)
Hardinge B.B. Vertical, Bench.
Becker #5C Vertical, Cone Dr.
Cincinnati #3, #4, #5 Pl. Horiz.
Brown & Sharpe #12 Production. 18" Autom.
Brown & Sharpe #12 Production. 24" Autom.
Brown & Sharpe #0, 1, 1Y Horizontal.
Kempsmith #1, #2 Plain Horiz.
Cincinnati 18" Mfg. Plain.
Milwaukee #2K Vertical, M. Dr. Dial Type.
Milwaukee #3K Vertical, M. Dr. Dial Type.
Milwaukee #1½ Dbl. Overarm, Horiz.
Milwaukee #2B Dbl. Overarm, Horiz.
Milwaukee #3B Plain Horizontal.
Pratt & Whitney #2 Duplex, Motorized.
#3 Dial Type, H.S. Cincinnati Vertical Mill. Power Rapid Traverse, speeds up to 1300 r.p.m. Range—34"x16"x16" Head has 6" vertical with four stop indicator. Serial #4A3V1L-61. Timken Bearing. 10 h.p. motor drive in base. Two available.

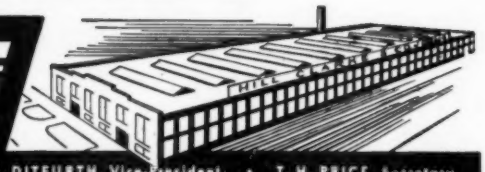
UNIVERSAL MILLING MACHINES

Ames Bench, 12" x 3" x 7½" W/Index Hd.
Index #40H, 16"x8½"x16"
B & S #2, 20"x5"x17½"
B & S #1½, 20"x7"x18"
Bridgeport, 20' x 9' x 16" Turret Type.
B & S #1D, 24"x8"x15".
Garvin #2MU, 24"x8"x18".
K & T "Milwaukee" #2, 28"x10"x17".
Kempsmith #2, 28"x8½"x18"
Cincinnati #2, 28"x10"x18".
Cincinneti #2M, 28"x10"x18".
B & S #3, 34"x10"x21".
Cincinnati #3S, 34"x12"x20".
Some w/index heads & equipment.

RADIAL DRILLS

Cinci-Bickford 6' Arm, 15" Col. 24 Speeds.
Cinci-Bickford 5' Arm, 13" Col. 24 speeds.
Fosdick 5' Arm, 14" Col. Hvy. Duty, Motorized.
American 4' Arm, 11" Col. Motor on arm.
Cinci-Bickford 3' Arm, 9" Col. 12 Speeds.

HILL-CLARKE MACHINERY COMPANY



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AUTOMATICS
1¼" Greenlee, 6 Spdls. (1941)
No. 61 New Britain 6 Spdls. 1⅝" (1942)
No. 6 Brown & Sharpe
No. 49 New Britain, 4 Spdl. Chucker
Model A 2½" Cleveland (1943)
Model A 3¾" Cleveland (1942)

DRILLS
No. 150 Baker
No. D8 Colburn, No. 6 Morse Taper
No. 1-LMS Leland-Gifford's (1942)
No. 2-LMS Leland-Gifford's (1942)
No. 4BL Natco 36 Spdl.
6'-17" Col. Foodick Radial

GEAR MACHINES
No. 61-A Fellows Gear Shaper (1942)
No. 7125 Fellows (1943)
No. 72 Fellows Gear Shaper
No. 18H Gould & Eberhardt
12" Gleason Bevel Gear Cutter
37" Gleason Bevel Gear Planer
72" Cincinnati Gear Cutter

BORING MACHINES
No. 31 Lucas, 3" bar
No. 46-B Heald Bore-Matic
No. 112—C Excello 2 Spdl.
42" Bullard New Era
42" Colburn
60" Colburn
73" Niles Extra Heavy
84" Betts

GRINDERS
3"x12" Brown & Sharpe No. 5 (1944)
4"x12" Landis, Model H (1942)
6"x18" Norton Type C Plain (1943)
6"x30" Norton Type C Plain (1943)
10"-14"x36" Norton Type C Plain (1942)
10"x18" Norton Type C Plain (1943)
10"x48" Norton Type C Plain (1943)
Norton Motorized Grinders ranging from 6"x18" to 24"x240"
No. 5—8"x24" Covel Hydr. Surf. (1941)
No. 36-A Hanchett Rotary Surface
72A-3 Heald Internal Grinder (1942)
72A-5 Heald Internal Grinder (1943)
74 Heald Internal Gdr. (1942)
Bryant Internal Grinders (1942)

LATHES
16"x54" centers LeBlond (1941)
16"x60" centers Pratt & Whitney, Model B
18"x6' American, Grd. Head
18"-38" gap x 10' LeBlond
36"x30' Lodge & Shipley
36"—48"x16' Lehman Hydratrol (1945)
8"x15" Sundstrand, Model D (1943)
10" Sundstrands (1942, 1943)
16" & 20" Fay Automatics (1942)
No. 4 Gisholt Univ. Turret Lathe (1942)
No. 4R Libby, Bar Feed (1942)
No. H-5 Libby
No. 5 Bardons & Oliver (1942)
No. 5 Midland, Bar Feed (1942)
No. 2-A Warner & Swasey
No. 1-H Libby, 6¼" Hole in Spindle (1937)
No. 1-H Libby, Extra Long Bed (1942)
18" Libby, 3½" Hole in Spindle
No. 4A Warner & Swasey, 7½" Hole in Spindle

MILLING MACHINES
No. 2 SP Van Norman Plain (1942)
No. 4 Cincinnati Plain (1943)
No. 2 H Milwaukee Vertical (1942)
No. 2 Cincinnati Vert. (1942)
No. 2M Cincinnati Vert. (1941)
No. 3 Cincinnati H.P. Vertical
No. 1-18 Cinn. Mig. (1940)
No. 2—18" Sundstrand-Electromil (1942)
No. M-24 Milwaukee Simplex (1942)
36"x40"x10' Fitchburg Duplex Miller (1943)
No. 4-48 Cincinnati Hyd. Tracer (1942)
No. 34-48 Cincinnati Hyd. Duplex
No. 45-48 Cinn. Hyd. Duplex
No. 56-72 Cincinnati Hydromatic
4½"x12" Pratt & Whitney, Model C
8"x36" Lees-Bradner—Model HT (1943)
10"x48" Hanson-Whitney Thread
24"x24"x12' Ingersoll Adj. Rail
36"x36"x16' Ingersoll Slab Miller
No. 10 Ingersoll 72"x6' Travelling Col. Face Millers (1942)

MISCELLANEOUS
18" Dill Slotter
Micromatic Vertical & Horizontal Hydrohoners
8-M Wells Band Saw

PLANERS
36"x36"x12' Cincinnati
36"x36"x18' Gray, 4 Heads
48"x36"x14' Gray
48"x48"x12' Cincinnati, 4 Heads

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HEADLINERS

LATHES
12"x30" MONARCH Model C Tool Room
16"x10' AMERICAN 12-speed Grd. Hd., AC MIB taper
18"x12' LODGE & SHIPLEY Selec. Grd. Hd., AC MD
20"x8' LODGE & SHIPLEY Selec. Grd. Hd., AC MIB, taper
22"x10' ROCKFORD 3 SCD DBG bowl hd.
24"x12' BOYE & EMMES, 1C Turner Uni-Drive
24"x12' AMERICAN Grd. Hd., AC MD, taper
24"x14' LODGE & SHIPLEY, Turner Drive, taper
26"x12' BOYE & EMMES, 3 SCD DBG, QC
30"x16' LODGE & SHIPLEY, Lima Drive, taper

MILLERS
#2 CINCINNATI H.P. Rect. & A Plain, AC MIB, PRT, Timken
#2B MILWAUKEE Plain, AC MD, DOA
#3B MILWAUKEE DOA Plain, AC MIB, PRT
#4 CINCINNATI H.P. Univ., Lima Drive, div hd., slot. attach.
#4 CINCINNATI H.P. Rect. & A Plain, PRT, AC MD
#4B CINCINNATI HP. Rect. & A Univ., AC MIB, div hds
#5 CINCINNATI H.P. Rect. & A Plain, PRT, AC MD

SHAPERS
24", 28", 32" GOULD & EBERHARDT
24" AMERICAN "Auto Oiled", AC MD
28" AMERICAN Hvy Duty, AC MD
32" CINCINNATI Hvy Duty, AC MD

RADIAL DRILLS
3½' AMERICAN "Triple Purpose", AC mtr on arm
4' MORRIS, Enclosed Head, AC MD
6' CINCINNATI-BICKFORD, mtr on arm
7' DRESES, AC MD

GRINDERS
#3 ABRASIVE Surface, AC MD
#22 HEALD Rotary Surface, new 1943
10"x24" LANDIS Type C Univ. Hydr., new 1943

BORING MILLS
#3A UNIVERSAL Horz. 3" bar, SPD
#42 LUCAS Horz., AC MD, 4½" bar, 20' betw. faceplate & outer support
36" KING Vert. Boring Mill, AC MD

GEAR MACHINERY
#12H GOULD & EBERHARDT Hobber, AC MD
#18H GOULD & EBERHARDT Hobber, AC MD
#34 BROWN & SHARPE Hobber, AC MD

TURRET LATHES
#4-L GISHOLT Hvy Duty Grd. Hd., AC MD, hardened stripped ways, threading attachment, new in 1940
#4-W CINCINNATI-ACME Univ., AC MD, thread chasing
#3 WARNER & SWASEY Univ. Grd. Hd., AC MD

MISCELLANEOUS
16"x21" FAY Automatic Lathe, new 1942
10x51" FAY Automatic Lathe, new 1943
XB-10 OILGEAR Broach, AC MD

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COX MACHINERY CO.,
P. O. Box 1953 CINCINNATI 1, OHIO
OFFICE AND WAREHOUSE: 311-313 Bakewell St. Covington, Kentucky
Three minutes from the Cincinnati hotel district.

AUTOMATICS—Natl. Acme 1⅝", four spindle, Bargain (2)
BRAKE—(Press) Verson 10'x1½" (1942)
HYDROHONER—Micromatic Model #4H (1943)
LATHE—Bamford-Chase Tool Room, 14"x6' Taper, Late Bridgeford, Engine, g. head, 32"x21' centers.
MILLER—Plain K. & T. #4K, Late.
PLANER—Cleveland Openside 60"x60"x20', Late, Niles Bement Pond 48"x48"x26', 4 heads.
PRESSES—(2) Bliss #305, 100 ton, Late.
(2) Bliss #6, 125 ton, Late.
Clearing—200 Ton (1943)
Bliss #310—440 Ton
(1) Lake Erie, 750 ton, Hydraulic, Bed 72"x148" single or dble action, Late.
ROLLS—Bending 30'x¾" Pyr. 10'x½" Pyr. 12'x½" Initial.
WELDERS—(New) Sterling 10, 30 KVA, Bargain.

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FOR SALE
INDUSTRIAL CHILLING MACHINE
DEEP FREEZE CASCADE 120° F. Height 38". Length 87". Width 32¼". Approximately 7½ cubic feet. WITH 2 MOTORS, ⅓ and ¾ HP. 3/60/220.
PRICE $850.00
WINSTON MACHINERY CO., INC.
517 South Delaware St., Indianapolis 4, Ind.

Bor. Mill, Hor. 3" G & L MD. 4½" N-B-P—MD.
Boring Mills, 24"-30"-42"-52"
Drills, Radial 3'-4'-5'-6' Cin.-Bick.
Lathe, Turret 3-A W and S, S.P.D.
Millers, Plain No. 3 K and T, No. 4 Cin.
Millers, Vertical No. 3 and No. 4 Cin.
Shaper, 16"-20"-24"-36"
Shaper, 36" Morton Draw Cut.
Shears, 42"-90"-72"-132"
West Penn Machinery Company
1210 House Bldg. Pittsburgh, Pa.

Logan Model 840 Engine Lathe.
Monarch 14"x36" centers Engine Lathe.
Hoan 80-ton Pneumatic Riveter.
D. E. DONY MACHINERY CO.
47 Laureiton Rd., Rochester 9, N. Y.

Late type #4L Gisholt Turret Lathe with cross sliding turret, threading attachment and 9½" spindle. Now under power.
Price $7,950.00
FAIRFIELD EQUIPMENT CO.
100 Sanford Street, Fairfield, Conn.

LATEST TYPE NEARLY NEW MACHINES

AUTOMATIC SCREW MACHINES

CLEVELAND 9/16". 1¼" Model A Single Spindle, High Speed, Latest.
CONOMATIC 6". 4-spindle, LATEST
CONOMATIC 2½". 6 spindle, Latest Type
GOSS & DeLEEUW ⅝" Auto Chucker, 5 spdls, Latest
GOSS & DeLEEUW 6"x6¾" Auto. Chucker, 5-spindle, LATEST

BORING MILLS—HORIZONTAL

CINCINNATI-GILBERT 3½" Bar, Floor Type, Latest
DETRICK & HARVEY 4" bar, Floor Type
EXCELLO #112-B Single End Borematic, LATEST
GIDDINGS & LEWIS #45 5" Bar, LATEST
GIDDINGS & LEWIS #25, 2¼" Bar, M.D.
HEALD 48A, 49 Single End Bore-Matics, Latest
LANDIS #35, 3½" Bar, Floor Type, M.D.
LUCAS #41, 3" Bar, Table Type, Latest Type
NILES BEMENT POND 5" bar, floor type, M.D.
NILES BEMENT POND 8" floor type, M.D.
UNIVERSAL 3" bar, table type, high speed, latest

BORING MILLS—Vertical

BETTS 120" 2 swivel heads, AC, M.D.
BULLARD 61 Maxi-Mill, 2 heads, Motor Drive
BULLARD 36" 6-spdl MultAuMatic Type D, LATEST
BULLARD 12" 6-spdl MultAuMatic Type D, LATEST
BULLARD 8" 8-spdl Type J MultAuMatic, LATEST
BULLARD 24", 36" Vert. Turret "New Era", M.D.
BULLARD 24", 36" "Spiral Drive", LATEST
COLBURN 72" 2 swivel heads, PRT AC, M.D.
KING 62" 2 swivel heads, PRT AC Motor Drive
NILES 100" 2 Swivel Heads, PRT, AC Motor Drive

BRAKES—Power

CINCINNATI Series 200, 5'x8'6", Motor Drive
CINCINNATI Series 50, 6'-16"xs", LATEST TYPE
CINCINNATI Series 50, 4'x6', LATEST TYPE
VERSON #206, 10 gauge x 96", LATEST TYPE

BROACHES

AMERICAN V-2, 6-ton Vertical, hydraulic, Lat. Type
CINCINNATI 1-50 Duplex Vert. Hyd., Latest Type
CINCINNATI 3-50 Duplex Vert. Hyd., Latest Type
La POINTE Model C.P.C. 5-36 Vert. Hyd., Lat. Type

DRILLS—Misc.

BARNES H-3-Hydrau, LATEST
BAUSH 1⅛x30" Deep Hole, LATEST
BOLEY ⅝" Cap. 10-spindle, Mult, LATEST
CINCINNATI-BICKFORD 24"; box col, LATEST
EDLUND 2MS 2-spindle, LATEST TYPE
LeBLOND No. 2 Deep Hole, LATEST TYPE
LELAND & GIFFORD 2LMS, 6-spindle, LATEST
LELAND & GIFFORD 1LMS, 4-spindle, LATEST
NATCO 1AL, 30 spindles, LATEST TYPE
PRATT & WHITNEY 1Bx50" Deep Hole, LATEST

DRILLS—Radial

AMERICAN 4' arm 11" col "Hole Wizard" LATEST
AMERICAN 4' arm 12" column Triple Purpose, M.D.
CINCINNATI BICKFORD 5' arm 15" col. Plain, M.D.
CINCINNATI BICKFORD 6' arm 15" column, M.D.
DRESES 4' arm 15" column, Plain Motor Drive
DRESES 5' Arm, 15" Column; Univ., M.D.
WESTERN 6' arm 20" column, High Speed, LATEST

GEAR CUTTING EQUIPMENT

BARBER COLMAN #12 Hobber; motor drive
BROWN & SHARPE 6-60 Gear Cuter, M.D.
BROWN & SHARPE #13 Spur, Bvl Gr Cutter, M.D.
CROSS No. 1 Tooth Rounder, M.D.
FELLOWS Model Z Gear Shaper, High Speed, Latest
FELLOWS 61, 61A, 7A, 72, 75, 77, High Speed Gear Shapers, Latest Type
FELLOWS Type 6Z2 Gear Shaper, High Speed, Latest
FELLOWS #13 LS Lapping, Latest Type
FELLOWS 8M Red-Liner, LATEST TYPE
FELLOWS 12M Involute, LATEST TYPE
GLEASON No. 1 Hypoid Grinder, LATEST
GLEASON No. 4, 6, 13 Tester, LATEST
GLEASON 7" 12" Straight Bevel Generator, Latest
GOULD & EBERHARDT 12H, 12HS Hobber, Latest
GOULD & EBERHARDT 36H with Differential
KOEPFER WM-11 Hobber; LATEST TYPE
PRATT & WHITNEY 10" Grinder, hyd., latest
SYKES #1½ 18" Cap. Herringbone Gears, M.D.

GRINDERS—Cyl.—Plain & Univ.

BROWN & SHARPE #1, 2, 3, 4 Universal, Latest
BROWN & SHARPE #3 Plain, 3x12, Latest Type
LANDIS 4"x12", Type H, Plain, Hyd., Latest
LANDIS 6x18 Type C, Plain, hydraulic, latest
NORTON 6"x18", 6"x30", Type C Plain, Hyd., Latest
NORTON 10x72 centers Plain Type C Mech., Latest
NORTON 14x36" centers Plain Type C Hyd., Latest

GRINDERS—Misc.

BARBER COLMAN No. 3, 4 Hob Sharpener, LATEST
BROWN & SHARPE #12 Univ. Cutter, Tool, LATEST
BRYANT #16-CP-16, #24, Int. Hyd., Latest
CINCINNATI #2 Centerless, "Filmatic", Latest
CINCINNATI "Monomet" Tool & Cutter, Latest
COVEL #22 Universal Tool & Cutter, Latest Type
EXCELLO #16C Carbide, Latest
FITCHBURG 14"x25" Centers Spline, LATEST
FITCHBURG 14"x25" Spline, Hydraulic, Latest
GARDNER 24-52" Disc., LATEST TYPE
GLEASON No. 12 Sharpener, LATEST
GLEASON 12" Spiral Bevel, LATEST
GLEASON #12 Tool Sharpener, Latest Type
HEALD 75A, 72A3, 72A5, 74, 76A Internal, Latest
HEALD #72A3, 72A5 Internal "Gagematic", Latest
JONES & LAMSON 6x15, ss'ss, Auto. Thread, Latest
LANDIS No. 12 Centerless, Hyd., LATEST
LANDIS No. 6 Thread, LATEST TYPE
PRATT & WHITNEY Contour, Latest
THOMPSON 6"x18" Auto., Round Broach, M.D.

GRINDERS—Surface

BLANCHARD #11—16 chuck, Latest Type
BLANCHARD #16—24" chuck, Motor Drive
DO-ALL Model G-7, 9"x26", Hyd., Latest Type
HANCHETT Series 300, 12x18" Vert. Spdl., LATEST
HEALD #22, 12" chuck, Rotary, Latest Type
HEALD 25A, 16" or 30" Chuck, Rotary, Hyd., Latest
NORTON 6"x18"—Hyd.—Latest Type
THOMPSON 12x12x24 Type B Hyd., Latest

JIG BORERS

FOSDICK No. 12; table 44x22"; NEW 1947
KEARNEY & TRECKER Model B Autometric LATEST
PRATT & WHITNEY No. 1A Precision, M.D.
VERNON Precision; High Speed, LATEST

LATHES—Engine and Mfg.

AMERICAN 36"x360" centers, 2 carriages, M.D.
BRIDGEFORD 36"x24' centers, 2 carriages, M.D.
JONES & LAMSON "FAY" 20"x27" Automatic, Latest
LeBLOND 13"x12" Centers "REGAL", LATEST
LEHMAN 16x30 hydratrol, Tmaken, Latest Type
LODGE & SHIPLEY 18"x72" centers, M.D.
LODGE & SHIPLEY 12"x54" Timken, LATEST
LOSWING 4x60, 4x84, 8x60, 8x108, 8x216" centers, latest
MEDART #6 LSF Bar Turner, LATEST
MICHIGAN No. 17D Univ. Reliever, LATEST
MONARCH 12"x30" Centers Model CKK, LATEST
MONARCH 12"x54" Centers Model CK, LATEST
MONARCH 16"x288" Centers, Geared Head, M.D.
MONARCH 16"x78" Centers Model CW, LATEST
MONARCH 22"x456" Centers, 3 carriages, Timken, Model CM, M.D.
MONARCH 24"x144" Ball Bearing, Geared Head, M.D.
MONARCH 10x20" centers, Model EE Timken, Latest
MONARCH 24"x54" centers, geared, Motor Drive
NILES 90x110 centers Standard Driving Wheel M.D.
NILES 30"x50" Centers, "Time Saver", LATEST
PRATT & WHITNEY 16"x30" Centers, 14"x54" Centers, Model C Timken Bearing, LATEST TYPE
PRATT & WHITNEY 10x30" centers, Bench, Latest
PUTNAM 42"x25" centers, geared, Motor Drive
REED PRENTICE 20"x54" Centers Model A, LATEST
REED PRENTICE 16x24" centers, geared head, M.D.
SCHUMACHER & BOYE 20"x78" centers, geared, M.D.
SPRINGFIELD 16"x30" centers, Timken, Latest Type
SPRINGFIELD 14x30" centers Geared Head, M.D.
SUNDSTRAND Model B 12" 22", LATEST
T'S No. 810-B Cutter Reliever, LATEST
WARD HAGGAS & SMITH 18x36"x10' bed, Gap

LATHES—Turret

BARDON & OLIVER #5, #7 Timken, Latest Type
CINCINNATI ACME No. 1, Latest Type
FOSTER 4FU, Fastermatic, Timken, Latest Type
GISHOLT #3, 4, Univ., Timken, Latest Type
GISHOLT #1L, #2L, #3L Universal, Timken, Latest
JONES & LAMSON #3, #5, Univ., Latest Type
LIBBY 1-H-5 Univ., TIMKEN, LATEST
POTTER & JOHNSON 5D, 5D2E, Timken, Latest
MOREY No. 2G, No. 3, No. 4 Timken, Latest Type
WARNER & SWASEY 2A Univ., Bar & Chuck, Timken Bearing, Latest Type
WARNER & SWASEY No. 4A Univ. Timken Bearing, Serial Over 1,000,000, New 1947
WARNER & SWASEY 5, 1A Timken, Motor Drive

MILLING MACHINES—Mfg.

CINCINNATI 24" Duplex, M.D.
INGERSOLL 30"x24"x12" Plnr. Type; Slab, A.C. M.D.
INGERSOLL 42x8x12" Planer type, Adjustable rail, 4 heads, AC, M.D.
INGERSOLL 32x2½x16" Planer Type 2 heads, AC, M.D.
SUNDSTRAND Model 3A Duplex, Timken, Latest Type
TAYLOR & FENN M-80 Duplex, Spline, Latest Type

MILLING MACHINES—Plain

BRIGGS Type A Hyd., 12" feed, Latest Type
BROWN & SHARPE #12, 24" feed, Timken, Latest
BROWN & SHARPE #000 Auto. Timken, LATEST
BROWN & SHARPE 2B, 3B, Timken, Latest Type
BROWN & SHARPE No. 2 Light Type, Timken, Latest
CINCINNATI 1-12, 2-18 Auto. TIMKEN, LATEST
CINCINNATI #4 Timken Bearing, Motor Drive
CINCINNATI #3, 4, 5, High Power, Motor Drive
CINCINNATI 4-36 Hydromatic, Timken, Latest Type
CINCINNATI 0-8 Auto. rise and fall, Timken, Latest
KEARNEY & TRECKER #3, 4 heavy, Timken, Latest
KEARNEY & TRECKER 1404 Simplex, LATEST
KEARNEY & TRECKER 1218 Simplex, LATEST
KEARNEY & TRECKER 2H, 3H, 4H, LATEST TYPE
KEMPSMITH 36, High Speed, Timken, LATEST
KEMPSMITH #4 Maxi-Mill, Timken, Latest Type
U.S. Model MM-1-6 Multi-Miller, LATEST

MILLING MACHINES—Vertical

BROWN & SHARPE No. 2B; High Speed, LATEST
CINCINNATI 0-8 Timken Bearing, Latest Type
CINCINNATI #2, Dial Type, Timken, Latest Type
CLEVELAND No. 1; High Speed, LATEST TYPE
GORTON 8SpD 9J Super Speed, Latest Type
KEARNEY & TRECKER #3H, Timken, Latest
MOREY No. 12M, single spindle Profiler; LATEST
MOREY No. 12M, double spindle Profiler, LATEST
REED PRENTICE 3VG with or without Hydraulic Duplicator, Timken Bearing, Latest Type
REED PRENT'CE No. 2V; High Speed, LATEST

MILLING MACHINES—Thread

HALL style D Planetary, LATEST TYPE
HANSON & WHITNEY 4"x9" centers, Latest Type
LEES BRADNER 12x54, Model HT, Latest Type
PRATT & WHITNEY 6x60" Type C, Latest Type
MOREY 12x50, 12x60, Latest Type

MILLING MACHINES—Universal

AMES 2¼"x19" Table, Latest Type
BROWN & SHARPE No. 2A, Timken, LATEST
BROWN & SHARPE 2A, 3A, 4A Taper Nose, M.D.
HARDINGE Model UM, Timken, Latest Type
KEARNEY & TRECKER 2H, 3H Timken, LATEST
KEARNEY & TRECKER #2 Heavy, Timken, M.D.
KEMPSMITH #4 Maxi-miller, Timken, Latest
VAN NORMAN #3, Duplex, Motor Drive
VAN NORMAN No. 26, Timken Bearing, LATEST
VAN NORMAN No. 56, Timken Bearing, LATEST
VAN NORMAN No. 12, Timken Bearing, LATEST

PLANERS

CONSOLIDATED 81"x84"x16' 4 Heads, P.R.T., Box Table, D.C., M.D.
DETRICK & HARVEY 48x48x16', 4 heads, Hyd.
GRAY 36x36x8', 2 heads, maximum duty, DC, M.D.
NILES 48"x48"x12' "Time Saver" 3 Heads, Box Table D.C. Reversing, P.R.T., M.D., LATEST TYPE
NILES 42"x42"x14' "Time Saver", LATEST
P.R.T. VARI VOLTAGE Drive, LATEST
NILES 48"x48"x14', 4 Heads, P.R.T., Box Table, D.C., M.D.
NILES BEMENT POND 48x48x16', 3 heads, AC, M.D.
NILES 54x54x18' 4 Heads, Box Table, DC, M.D.
SELLERS 20' Plate Edge, Motor Drive
WOODWARD & POWELL 54x54x20', 4 heads, DC, M.D.

PRESSES

BIRDSBORO 325 ton, vert. hyd., Latest Type
CHAMBERSBURG 50 ton vert. hydro-pneumatic
CLEARING Type DS 1125-32 dbl., action 125 ton
HUSEY & WRIGHT 40 ton Drilling, Hyd. Feeds, M.D.
HPM 37-ton Vertical Hydraulic, Latest Type
NILES 400 Ton Hortz, Wheel Press, Motor Drive

SHEARS—Power

NIAGARA #3120, 10 gauge x 10', "D"
GUICKWORK ¾", 1" Cap. Rotary, M.D.
WYSONG & MILES #572, 14 gauge x 6' LATEST

MISCELLANEOUS

AJAX 2", 2½" Bolt Heading, Upsetting and Forging
BAKER No. 3 Keyseater, Motor Drive
BARNES #172, 30GH, 50G Vertical Hone, Latest Type
CAMPBELL #401 Abrasive Saw, Latest Type
CINCINNATI Centerless Lapper; Model ED, LATEST
CLEVELAND 12"x16" Cutter Reliever, Motor Drive
DeLAVAL No. 194 Coolant Clarifier, LATEST
GROB #08-20 Band Saw & Filer, Latest
LANDIS 2" Double Spindle Bolt Threader, M.D.
MANVILLE No. 2D Ball Header, Motor Drive
NAZEL 4B Pneumatic Hammer, Motor Drive
PELLOW #2 Nut Slotter, Latest Type
PRATT & WHITNEY ½-B50 2 spindle Rifler, Latest
PRATT & WHITNEY "Keller" Type G, Type BL2416, 2 or 3 dimensional, LATEST TYPE
REED No. 20 Thread Roller, LATEST TYPE
STOEVER 4"-12" Pipe Threader, Motor Drive

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1—#4 Standard Kane & Roach 8-Roll Straightener
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All above with A. C. motors.

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No. 25T G. & L., 2½" table Hor. Mill, 1942
4" Univ. Table Mill, 60" vert., 96" hor., 1943
36" & 42" King Side Hd. Vert. Mills, '43
Nos. 1A & 3 W. & S. Turrets, bar & chuck
4'11" col. Eick. radial, '47; #262 Barnes drill
3' 11" Fosdick & 3' 9" Amer. Radials, '43
28 60 Cinci. Hydrotel Vert. Miller, 1 spin.
360" Cinci. 4 Spin. Profiler, 1942
Nos. 3 & 2MH Cinci. Pl. Dial Millers, late
Nos. 3K & 3H K. & T. Pl. Dial Millers, late
No. 36 Van Norman Pl. Miller, ram, '43
No. 2G Kempsmith Univ. Miller, 1943 (3)
No. 2416 Keller Duplicator, late
Nos. 9J Gorton Duplicator & Vert. Miller (2)
Bridgeport Vert. Miller, slotting (3)
12"x24" G. & L. No. 45 Surface Grinder, '42
No. 70A Heald Internal Grinder, 1942
Gear Cutter, No. 13 B. & S., spur & bevel

BENNETT MACHINERY CO.
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LATE TYPE MACHINES

3'-9" American "Hole Wizard" Radial
10"x48" Norton "C" Plain Grinder
#70-A Heald Internal Grinder
Model 2-H Micromatic Hydrohoner
#3H Milwaukee Plain Miller
#3MS Cincinnati Miller
8"x48" J&L Thread Grinder

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Metal Forming and Bending Machine
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Roller Type Slab Miller 22" Slab capacity
12 Spindle Meline Automatic Drilling Machine
5 Spindle Meline Model 7-D Cylinder Borer
1-A W&S Universal Turret Lathe
16" x 14' Schumacher & Boye Engine Lathe
Libby 26" x 4½" Spindle Turret Lathe
26" Stockbridge Shaper
Lees-Bradner CT 36" Thread Millers
Crankshaft Grinder
Foote-Burt 4 Spindle Drill #2 M.T.
Acme Gridley 4 Sp—Model G—1¼" Auto.

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AUTOMATICS
6" RPA-8 Acme Gridley Chucker. 1941.
16" Bullard Mult-Au-Matic, 6 spdl. '41.
1⅝" Greenlee, 6 spindle. 1942.
9/16" RA-6 Acme Gridley. 1942.
No. 0G Brown & Sharpe. Latest.

BORING MACHINES
No. 42 Lucas Horizontal. 1940.
No. 54 Excello Double End. 1940.
No. 49 Excello Double End. 1942.

DRILLS, HEAVY DUTY
25" Fosdick "Economax". 1941.
No. 121 & 217 Baker. 1941.
W-6 Brush Hyd. Mult. Spdl. 1943.
No. 40 Fox Multiple Spdl. 1944.

DRILLS, RADIAL
4'11" American Hole Wizard. 1943.
4'9" Cincinnati Bickford. 1944.
3'9" Cincinnati Bickford. 1946.

GEAR EQUIPMENT
3" & 12" Gleason Generator. 1941.
12" Gleason Rougher. 1943.
No. 6 & 17 Gleason Testers. 1943.
12" Red Ring Internal Shaver. Late.
No. GCL-3 Red Ring Shaver. 1942.
No. 6A & 712 Fellows Shapers. 1942.
No. 18M Fellows Finisher. Late.
Vinco Spline & Gear Grinder. 1942.

GRINDERS, CYLINDRICAL
16"x36" Cincinnati Plain. 1942.
12"x48" Cincinnati Univ. 1943.
10"x72" Landis Plain. 1942.
10"x18" Norton Plain. 1942.

GRINDERS, INTERNAL
No. 74 Heald Ext. Bridge. 1941.
No. 72A3 & A5 Heald Plain. 1944.
No. 5 & 16A22 Bryant. Latest.

GRINDERS, SURFACE
14"x36" P&W Vertical. 1938.
No. 22 & 25A Heald Rotary. 1943.
No. 2B & 2-3 Reid. 1942.

LATHES, ENGINE
32"-45"x22" Axelson. 1942.
28"x28' Bertram. 1942.
24"x168" Sidney. 1942.
18"x54" Lodge & Shipley. 1943.
16"x54" Springfield. 1943.
14"x54" Reed Prentice. 1942.

LATHES, PRODUCTION
Gisholt "Simplimatic". 1943.
No. 3A L&S "Duomatic". 1943.
No. 2FU Foster "Fastermatic". 1943.
20"x97¾" LeBlond Rapid Prod. 1941.
8"x108" Lo-Swing Semi. Auto. 1942.
Model 10 & 12 Sundstrand. 1942.
14"x42" Monarch "Magna-Matic". 1941.

LATHES, TURRET
36" Bullard Vertical. 1943.
No. 2A & 3A Warner & Swasey. 1943.
No. 1 & 8½"x24" Acme Univ. 1943.
No. 3L Gisholt. 1941.
No. 2, 3, 4 & 5 Warner & Swasey. 1943.
No. 2, 3, 5 & 7 Bardons & Oliver. 1942.
No. 1001-Z South Bend. Late.

MILLS, PLAIN
No. 5 Cincinnati. 1943.
No. 4H & 4K Milwaukee. 1943.
No. 3 Van Norman. 1942.
No 2HL Milwaukee. 1942.

MILLS, PRODUCTION
BL-2420 P&W "Keller", 3 sp. 1942.
BL-2416 P&W "Keller", 1 sp. 1943.
BG-1 Keller, single spdl.
No. 1848 Kearney & Trecker. 1942.
No. 1248 Kearney & Trecker. 1942.
No. 1-18 & 2-18 Cincinnati. 1942.

MILLS, THREAD
6"x60" Pratt & Whitney. Latest.
12"x54" Lees Bradner. 1942.
8"x16" Hanson Whitney. Late.

MILLS, UNIVERSAL
No. 2MH Cincinnati. 1942.
No. 2H Milwaukee. 1942.
No. 2SU & 26SU Van Norman. 1943.

MILLS, VERTICAL
No. 3H & 3K Milwaukee. 1942.
No. 2 & 3 Cincinnati. 1941.
No. 2K Milwaukee. 1942.

PRESSES
No. 40-5½ Minster. 1946.
No. 8R Rockford. 1946.
100 Ton Hannifin, Hyd. 1942.
45 Ton Reliance. 1942.

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AUTOMATICS
Brown & Sharpe #00G, H.S., #4, #6
Conomatic 8 sp. 1⅞" cap.
New Britain Gridley 6I—6 Sp. 2¼"

BORING MILLS
Giddings & Lewis #8, #25T, Bullard, 42" V.T.L.
Universal 3" horiz., Lucas #3I horiz.

DRILLS AND RADIALS
Amer. 4'-13" col. Radial, Canedy-Otto 3'-9" col.
Carlton 8'-19" col., Foote-Burt 6 Sp.
Cincl-Bickford Super Service, 21", 24"
Nates Model E-5 Multi-Spindle, 14 spindles
Sibley 24—28", Allen 6 Sp., Excelsior 21"

ENGRAVERS
Gorton #3U, 3Z, 3L; Deckel GI, GIF
Gorton Cutter Grinders 575-2, 265-5

GEAR EQUIPMENT
Fellows #72, 725 High Speed, Mikron Gear Hobber
Michigan, Gleason, Fellows Checkers

GRINDERS—Miscellaneous
Brown & Sharpe #5 cyl., 3"x18", Black Diamond
Brown & Sharpe #1, #3 Univ., #13 Univ. & Tool
Cincinnati #2 Centerless Filmatic, 12"x36, 12x48" Univ.
Covel #91A Univ. Tool & Cutter
Gardner #226, 36" disc, Heald #1 Tool, K. O. Lee Tool & Cutter, Hammond #4 Carbide
Landis #4H Cyl. 4x12", Landis #6 Thread, Centerless
Norton #2 Tool & Cutter, Porter Cable Belt WG8
Norton Cyl. 6x18" Type C, 6x30" Type C
Oliver #510 Drill Pointer, Sellers #4G
Pratt & Whitney Radius #R6, Gronby Int.

GRINDERS—Surface
Abrasive #1½" Wet, #34 Vertical, #33
Atlantic 6x18" Power Feed, Foote-Burt Hammond
Blanchard #18—42" Chuck
Brown & Sharpe #2
G. & L. #18, 6x18" Hand Feed, #25, #35 Hyd.
Hanchett #380, 13x48", Mattison 14x16x48 Hyd.
Norton 6x18" Hyd., Pratt & Whitney 12x36" Vert.
Reid #2A P.F., #2C Pope & Excello Spdl.
Thompson Hyd. 6x10x18", 6x12x18

LATHES
Bradford 16"x6', Hardinge Precision 9", cabinet
Hendey G. H. 16x30 with relieving att.
LeBlond Regal 10"x31½", 15x30", 19x48", 21x60"
Lodge & Shipley 16x78" T.A., LeBlond HD 16x33"
Monarch 10"x20" EE, 16x78" T.A., 12x30" CKK
Rivett Precision, Logan 10"x30"
South Bend 9"x3', 9"x31½", 13x36", 10" Cabinet
Sebastian 12"x4', G.H., Sheldon 11x24, 1" collet

LATHES—Turret
Acme #6W Bar and Chuck, 6W Fox Lathe
Bardons & Oliver #3, #5, Foster #3B
Brown & Sharpe #1, #2F Hand Screw Mach.
Gisholt #4, 5 Bar & Chuck
Jones & Lamson #8A Univ., Hardinge ESM
Oster #80I Rapiduction, Morey #3, 1½" cap.
Warner & Swasey #3, #4, #4A—6" Bar Cap.

MILLS—Plain & Universal
Brown & Sharpe #2B Pl., #2A Univ.
Cincinnati #3 Plain, 2MH Univ.
Milwaukee #2HL, 2H, Plain, #2HL, 2H, 3H Univ.
Van Norman #12, 20, 22L, 36

MILLS—Vertical—JIG BORERS
Brown & Sharpe #2, Index, Vernon, Bridgeport
Cincinnati #4 Dial Type, Jackson
Fosdick Jig Borer #42 Like New 1947
Gorton #8D, 9J Plain, #8½D Duplicator
Kearney & Trecker #3H, 3H High Speed
P&W 1½B Jig Borer, Sip Jig Borer #MP-5
Moore Jig Grinder, Vernon jig borer
Morey #12M Profiler 2 sp.—Pratt & Whitney 12B

MILLS—Production
Brown & Sharpe #000, 12, 2I
Cincinnati #1-12, 1-18, 2-18 Mfg.
Nichols Hand, U.S. NM 1, Kent Owens #1V
Sundstrand #00 Rigidmills, U. S. Duplex

PRESSES
Bliss #8 Dbl. Crank, Bed 42x100", 250 Ton
Bliss #675, 645B, 650 Hi-Production, 304A, 305A
Bliss #20, 21 O.B.I., #4½ Double Action Cam
Bliss #38 O.B. Gap Frame #62, 62A, 162
Henry & Wright 25, 60, 75 Ton Dieing; Reliance 45, 45 ton O.B.I.
Thomas 7A, 80 Ton O.B.I., Gen. Flex Elec. Screw
V. & O. #25B O.B.I., #102 Reducing, Z & H 30 Ton

MISCELLANEOUS
BAND SAW: DoAll Metalmaster, Tannewitz #36M
BENDING ROLL: Buffalo #8, Excelsior #14
BROACH: 3L LaPointe Horiz. Hydr.
HACKSAW: Marvel #6A Automatic, #6, #4B
HAMMER: Niles Bement Pond 2500 lbs. steam
HONER: Micromatic #H-1 Hydrohoner, Sunnen
INJECTION MOLDER: Reed-Prentice #10D6, 8 ounce, 8 ounce heating cycle
IRONWORKER: Buffalo 25U x 20 Univ.
KEYSEATER: Mitts & Merrill, Baker Davis
PRESS BRAKE: #253, #335 Chicago
ROUTER: Onsrud #W240, #55 Oliver
TAPPERS: Bakewell #1, Haskins #2C, 3C
THREAD ROLLER: Waterbury-Farrel #30 with Dies
WELDERS SPOT & SEAM: Sciaky, Thompson, Taylor Winfield
WRAPPING ROLL: Buffalo #½

HYDRAULIC EQUIPMENT

Cap.	Manufacturer	Platen Stroke	Opening
500 Ton	Lake Erie	35x36"	36" 60"
600	Bald. G'thw'k	70x59"	22" 30"
500 D.A.	H.P.M.	36x36"	24" 30"
1000	French Oil	53x42"	20" 50"
300	Brand New Watson Stillman Hobbing Press		
375 D.A.	Elmes	84x44"	12" 42"
350	Verson	40x40	36" 72"
50	Dennison	22x20	18 23
150	Southwark	34x30	30 2' to 4'

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DRILL, MULTIPLE

16 spindle No. 2BL Natco hydraulic. 16"x 24" drilling area. Has 30" dia. automatically indexing head. New in 1942.

DRILL, MULTIPLE

No. B4A Natco hydraulic. Now arranged as a 24 spindle fixed center distance "Holetapper." New in 1944.

DRILL, SENSITIVE

24" Foote Burt No. 2 six spindle with two spindles back geared. Serial No. 14279, new in 1942.

GRINDER, CYLINDRICAL

6"x18", No. 10 Brown & Sharpe "Electric Hydraulic" new 1940 & 1941. Three have spindle oscillation.

GRINDERS, CYLINDRICAL

10"x36" & 23"x36" Norton type C hydraulic with hydraulic in feed, also longitudinal travel. New 1942.

GRINDER, DISC

53", No. 372 Besly horizontal disc with 20 HP vertical motor drive. New in 1942.

GRINDER, INTERNAL

Nos. 16A16, 16CP16, 16-28, 16-38 & 24-36 Bryant. New from 1941 to 1943.

GRINDER, SURFACE

24", No. 25A Heald rotary, hydraulic feed. Serial No. 16051, new in 1942.

GRINDER, SURFACE

14"x80" Mattison hydraulic with 14⅜"x 80" magnetic chuck. New in 1939.

GRINDERS, THREAD

Nos. 33 & 35 Excello. New 1942 & 1943.

HONING MACHINE

No. 307 "Barnesdril" hydraulic, 25" stroke. Serial No. 3536, new in 1942.

LATHES

8"x15", No. 8 and 12"x20", No. 12 Sundstrand automatic stub with front & rear carriages and tailstock. New in 1942.

LATHES, TURRET

Nos. 3 & 4 Gisholt universal with bar feed, automatic chuck, etc. 1942 & 1943 tools.

LATHE, TURRET

No. 2 FU Foster "Fastermatic" with front & rear carriages, hex turret, hydraulic feed. Serial No. 2FU529, New in 1944.

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}—Norton 6"x18" Hydraulic & Hand Horizontal—Pope spdls.—chucks—coolant (late).

Blanchard #11 Rotary Surface, 10" chuck (late).

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B. & S. #13, 8"x24" Univ. & Tool, 2475 to 5730-RPM wheel speeds—attchmts.

Cinn. 14"x72" Univ. Film. Grg., attchmts. 1942.

PLAIN & INTERNAL GRINDERS

Cinn. #2 Centerless Film. Grg. cap 1/16" to 3½" dia. short work, ⅛" to 2" dia. bar work—long bar attchmt., Auto. infeed attchmt.

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Heald #72A3 Gage-Matic intern. grinder
Heald #72A Size-Matic intern. grinder
Milwaukee #4K plain milling machine, 1942
Cincinnati 24" duplex milling machine
Liberty 36"x36"x14' dbl. housing planer
Gould & Eberhardt 18" gear hobber
Fellows #712 gear shaper
Gleason 3" spiral bevel gear cutter
Brown & Sharpe #2G automatic, 1942
Conomatic 1¼" four-spindle, 1941
Acme-Gridley 3-5 16" four-spindle
Gisholt #1L, 2L, 3L turret lathes
Bardons & Oliver #3 turret lathe, 1943
Bullard 24" spiral drive vert. turret
Lucas #33 horiz. borer, 4½" bar
Hendy 18" geared head shaper
Landis 1½" bolt threader, lead screw
Hendey 16"x30" lathe, taper att.
Lodge & Shipley 12"x30" lathe
Bodine #42-30 drilling machine, 1942
Leland-Gifford 2MS drill press, 2-spdl.

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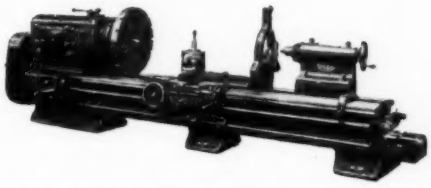

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No. 3A WARNER & SWASEY, bar feed, taper attach., threading attach., tooling, 1942

No. 2A WARNER & SWASEY, bar feed, taper attach., threading attach., tooling, 1942

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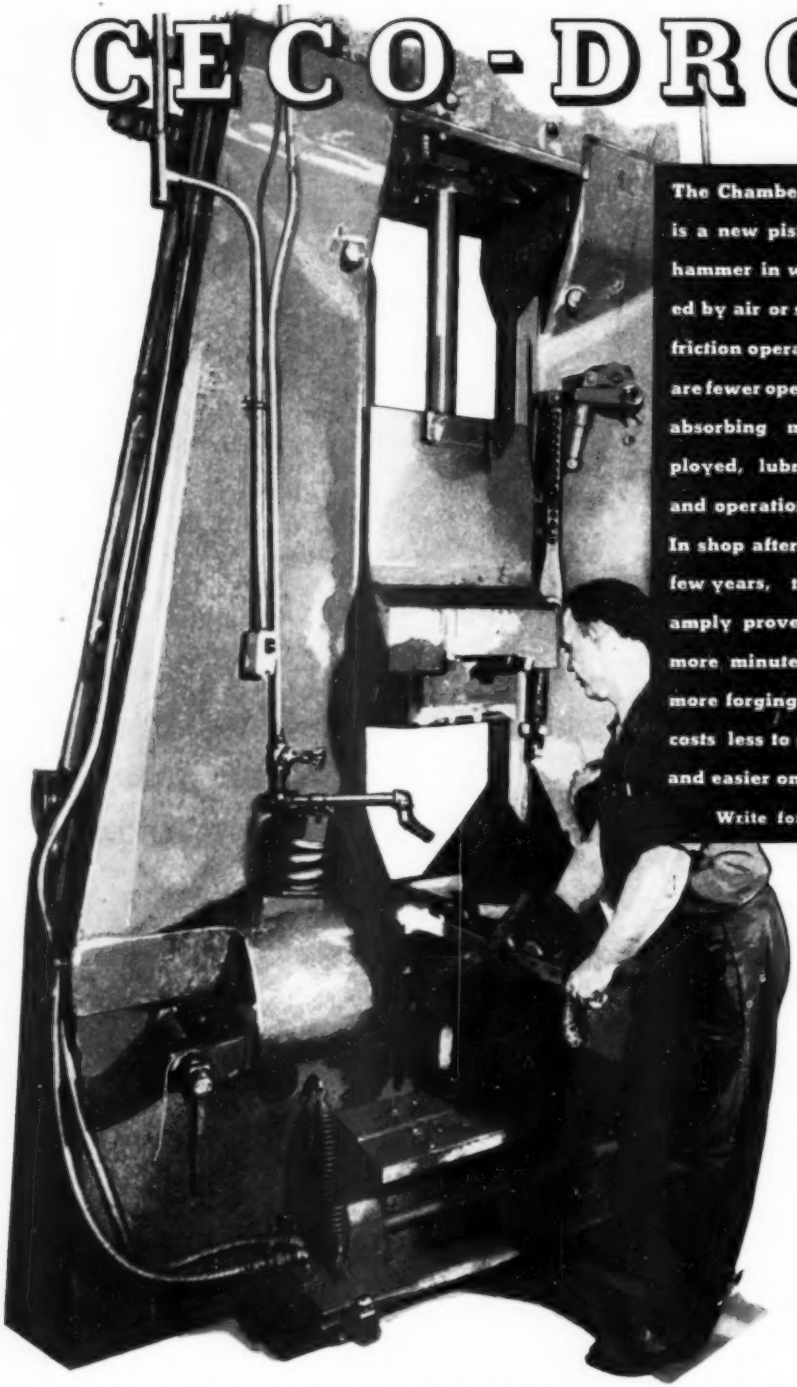

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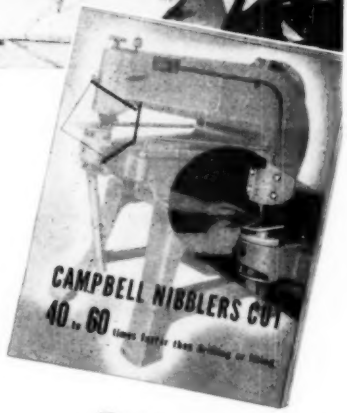

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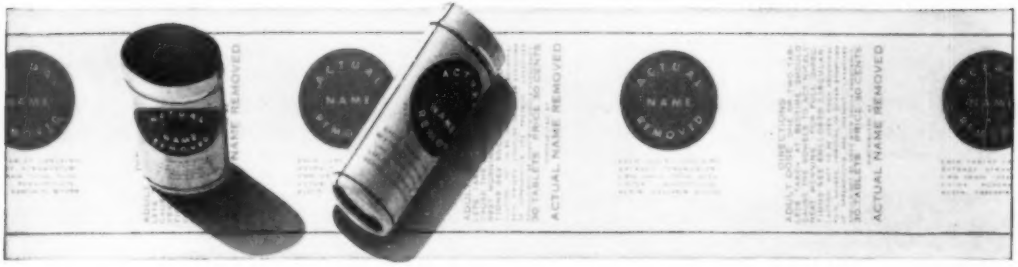
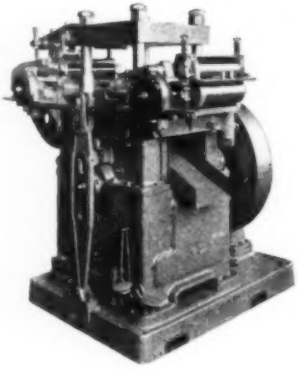
From 2-color lithographed stock



these cans COMPLETE-PER-STROKE at a production of 120 per minute on Henry & Wright Dieing Machine



50-TON STANDARD DIEING MACHINE

made in capacities of 10 tons to 300 tons. With the famous "Precision-guiding" and "Indirect Underdrive" permitting an unmatched combination of high production with high precision.

Here is a good example of the adaptability of the UNIQUE Dieing Machine—a 50-ton capacity machine in this instance being equipped with special feed to automatically insert lithographed strips in the roll feed mechanism, then blanking out can body (2-1/8 x 7/8 x 9/16), forming and seaming complete, including inserting can bottom (produced in previous operation) and seaming bottom, THE JOB DONE, 1 COMPLETE-PER-STROKE, 120 PER MINUTE. The production savings, which we are not privileged to quote here, are truly enormous. Remember—the unique "upside-down" automatic press known as the Dieing Machine is capable of unique accomplishments in Type of Operation, Quality of Product, Reduction in Cost. Savings habitually run 60% to 90%, with die cost life increased 600% to 1200%. The Standard and Speedmaster models offer you tremendous savings, helping you meet present-day cost problems. Let H & W engineers point the way.

Request Catalog 49

HENRY & WRIGHT

DIVISION OF

Hartford-Empire Company

487 WINDSOR STREET **HARTFORD 1, CONN.**

HENRY & WRIGHT DIEING MACHINES

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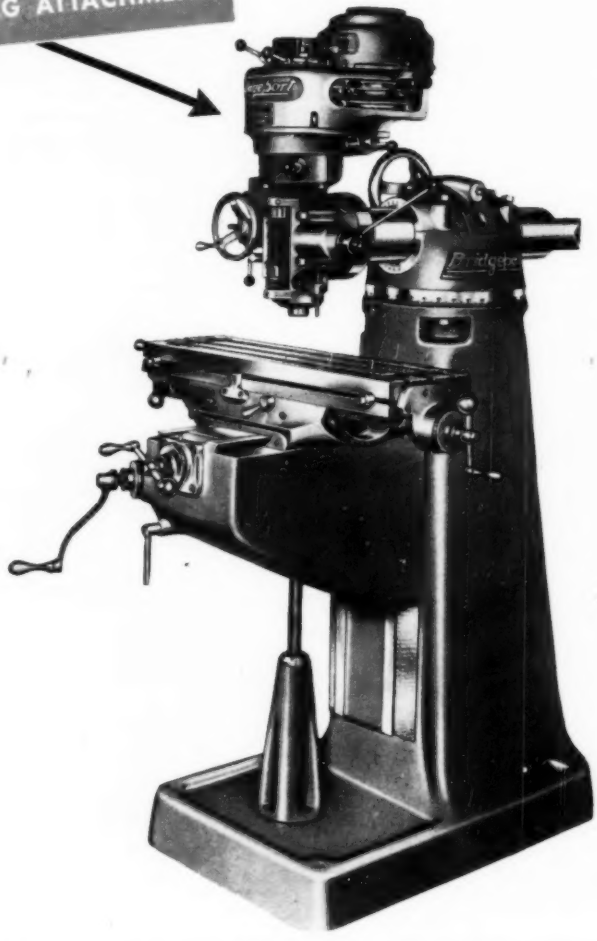
Announcing

THE NEW *Bridgeport*

1 H.P. MILLING, DRILLING AND BORING ATTACHMENT

...to meet demands for handling heavier work



This new "Bridgeport" fills a current need for a versatile machine capable of handling milling, drilling, and boring beyond the capacity of the universally popular standard Master Milling Attachment. A 1 HP motorized head provides ample power for the heavy duty work for which it is designed.

Modern features of this new attachment include:

- —eight spindle speeds from 80 to 2720 RPM.
- —back geared spindle drive unit designed to utilize full horsepower at all speeds without belt slippage.
- —5" quill travel.
- —power feed to quill in 3 steps: .0015-.003-.006 inch per spindle revolution.
- —positive two-way power feed stop tripping mechanism.
- —spindle brake and lock for convenient changing of tools.
- —collet capacity up to ¾" diameter.

Holders for shell mills and fly cutting heads available; also Bridgeport #2 Boring Head to fit this new milling attachment.

Further details available on request.

Bridgeport MACHINES, INC.

Bridgeport, Connecticut

Manufacturers of High Speed Milling Attachments and Turret Milling Machines

BETTER MACHINES *mean* GREATER EFFICIENCY AND HIGHER QUALITY

NEW BRITAIN MULTIPLE SPINDLE SCREW MACHINES PICTURED IN BURROUGHS 1948 ANNUAL REPORT AS PART OF THE COMPANY'S IMPROVEMENT PROGRAM.

649MC1

In 1947 and 1948 Burroughs Adding Machine Company reinvested a substantial part of its earnings in major equipment, including some New Britain Automatics. The results of this reinvestment policy were higher quality of product, greater efficiency and better working conditions.

New Britains' high productive capacity makes them the world's safest investment. Those who fail to make the investment take the risk by endangering their ability to compete. May we send you "IT CAN BE DONE," a brochure of actual histories which includes detailed information on the work New Britains are doing for leading manufacturers?

THE NEW BRITAIN MACHINE CO.
NB

NEW BRITAIN

Automatics

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT

Roughing cuts or precise finishing— TIMKEN® bearings help handle both

THIS Monarch 25″ Model N engine lathe is used for both heavy roughing cuts and precise finishing. With Timken tapered roller bearings throughout the headstock, spindle accuracy is assured. And, because of their tremendous load carrying capacity, Timken bearings take the shock of roughing cuts easily.

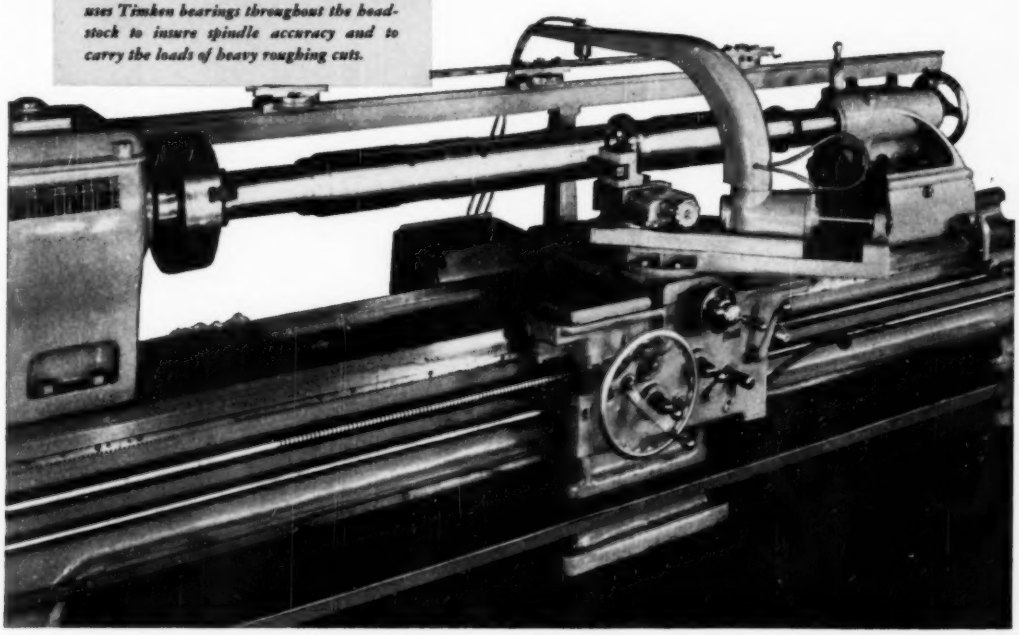
The tapered construction of Timken roller bearings carries tremendous thrust as well as radial loads without deflection or end-movement and permits preloading to any desired degree.

Timken bearings are manufactured to extreme precision and finished to incredible smoothness. The rolls and races are made of Timken fine alloy steel for toughness and case-hardened for exceptional resistance to wear. The line contact between rolls and races provides maximum load-carrying capacity.

No other bearings can give you *all* the advantages you get in Timken tapered roller bearings. Make sure you have Timken bearings in all the machines you build or buy. Look for the trade-mark "Timken" on the bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

THE MONARCH MACHINE TOOL COMPANY *uses Timken bearings throughout the headstock to insure spindle accuracy and to carry the loads of heavy roughing cuts.*



NEW TIMKEN BEARING CUTS RUN-OUT IN HALF!

Until now, the Timken "Zero" bearing has been the last word in bearing accuracy. Now Timken offers industry the "Double-Zero" bearing—*twice as accurate* as the "Zero"! Maximum run-out of the new "Double-Zero" bearing is only 75 millionths of an inch—*half* the 150 millionths run-out of the "Zero" bearing. What an opportunity for manufacturers of machines where extreme accuracy is essential! Available in standard single row types, up to 10" O. D. Write for further information.

TIMKEN

TAPERED ROLLER BEARINGS

TIMKEN 1899 50 1949 YEARS

NOT JUST A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ◫ AND THRUST ◫ LOADS OR ANY COMBINATION ◫